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THE PAN-PACIFIC ENTOMOLOGIST

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Vol. XXXII July, 1956 No. 3

NOTES ON THE BIOLOGIES OF MEGACHILE FRIGIDA SMITH AND M. INERMIS PROVANCHER (Hymenoptera: Megachilidae)[1]

W. P. STEPHEN[2]

During alfalfa insect investigations in the Sprague area of southeastern Manitoba in 1948 and 1951, preliminary studies were made of the nesting habits of two leaf-cutter bees, *Megachile (Delomegachile) frigida* Smith and *M. (M.) inermis* Provancher. In 1952 these two species were studied more intensively in the Ravendale district of northern Saskatchewan.

The features of the areas harboring species of *Megachile* were discussed by Stephen (1955:543–584) and it was suggested that a sequence involving decaying and decayed timber is essential to the propagation of certain species; the possibility of the occupation of vacant wood-borer holes by *Megachile* spp. was discounted and some contribution was made to a study of the environmental effect on bee populations.

MEGACHILE FRIGIDA Smith

This species is the most common megachilid found on alfalfa in the two areas and is most abundant in the sandy, wooded, western edge of the Laurentian shield. All of the notes were made on specimens nesting in decaying poplar. A total of 48 nests of this species were observed at various stages of construction in the years 1948, 1951, and 1952.

The most nearly complete account of nesting habits of the larvae was obtained from an individual nesting in a small poplar log lying in the midst of a 19-year-old burn.

At 2:35 p.m. on July 7, 1952, a female was observed to begin excavation of a tunnel on the upper southern face of a log. She excavated continually except for short flights requiring not over 10 minutes until 6:15 that evening. By that time the tunnel was slightly over four inches long and a pile of sawdust had accumulated beneath the entrance. Because of inclement weather, observa-

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tions were not resumed until July 9, at which time rain and wind had all but disposed of the sawdust, and the bee was in the process of cell construction. At 11:13 she left the nest, returning with a load of pollen at 11:38. She remained in the nest for 4½ minutes and then left again, returning with another pollen load at 11:58. This time she remained inside the nest for three minutes before leaving. At 12:37 she returned with the last pollen load for the cell. After 11 minutes in the nest she emerged and flew to a *Ribes* shrub about 25 feet from the nest. The first leaf-cutting was obtained in 11 seconds, followed by four more trips of 9, 16, 14, and 14 seconds respectively. All of these leaf-cuttings were round and small and were presumed to serve as cappings for the cell. On her return with the last capping, she remained in the nest for 6½ minutes.

Upon emerging she alighted on a log near the nest entrance and rested, expanding and contracting her abdomen. Then she re-entered the nest, emerged soon, and returned to the *Ribes* shrub, where she secured an oval piece of leaf slightly longer than her body. She obtained three more cuttings similar in size to the first in rapid succession and then remained in the nest for 37 minutes. During this period she would emerge from the nest at regular intervals and rest on a nearby log, where she would manipulate her abdomen. This abdominal manipulation continued for 1½ to 4 minutes and was followed by an immediate return to the nesting tube. Four more leaves were cut and transported to the nest before pollen and nectar gathering was begun. Two of the four pieces were cut from nearby *Ribes* shrubs and on both of these trips the female returned within 20 seconds. However, the third trip required 1 minute and 35 seconds and the fourth 48 seconds to complete. On the latter two trips the leaf cuttings had a much deeper green color and were much more glossy, and the source of the cuttings is not known.

At 4:44 she brought in the first load of pollen, unloaded, and was in flight 3½ minutes later. The second load of pollen was collected in 31 minutes, but during the 10 minutes before the return of the bee a light rain began falling. The rain increased in intensity and did not abate until 6:25. For the period of heavy rain the bee remained near the entrance of the burrow but took to flight as soon as the intensity of rain decreased. She returned at 6:40.

Observations were continued at the same nest at intervals throughout July and early August but because of the extremely wet weather it was impossible to make observations on successive days. However, there was considerable variation in all of the routine associated with cell construction. The time required to secure leaf cuttings varied from 9 to 13 seconds per cell; pollen loading required 11 to 65½ minutes; and probably a cell was formed under optimum flying conditions.

On July 28 the nest started on July 7 was exposed. There were nine completed cells and a lethargic female in the tunnel at the time. The cells were transferred to a ¼-inch glass tube for further observation. Three other small logs containing nests of *frigida* were removed to the laboratory in the hope of obtaining information on emergence dates.

The last-formed cell of the transferred nest was opened carefully on July 28 and placed in a small piece of ¼-inch tubing. The base of the tube was sealed with sealing wax and the apex plugged with cellulose cotton. The cotton plug was moistened daily to provide a suitable humidity for development. The food in the cell was entirely eaten by August 23 and the larva began to pupate on August 28. The cell was again examined on August 30, at which time the larva was dead, probably as a result of a fungus infection.

Six specimens of *frigida* were caught in the southeast part of Manitoba and the pollen was compared with samples obtained from the more common plants of the area. Three of the specimens had collected alfalfa pollen exclusively. The other three carried alfalfa pollen predominantly but had lesser amounts of fireweed and two unknown plant species.

One baffling situation that has arisen concerning *frigida* is the mortality of larvae in the nests brought into the laboratory. Six logs containing nests of this species were taken to the laboratory in 1947, four in 1948, and eight in 1951, but from these not a single adult specimen emerged. Upon examination, the cells contained dried remnants of the bees in a late pupal stage. None of the cells examined contained adults. From this it might be construed that this species nests under other, more favorable conditions and that poplar logs may be a limiting factor in its abundance. That the species nests in spruce has been substantiated, but year after year it is the most abundant species of *Megachile*

in Manitoba and is most readily found in decaying poplar logs.

MEGACHILE INERMIS Provancher

Observations on the nesting habits of *inermis* had been recorded for three summers in the Sprague area of Manitoba, but it was not until the summer of 1952, near Ravendale, Saskatchewan, that I was able to follow a single female through the completion of its nest. The nest was found on July 4 at 2:30 p.m. in a habitat of decaying poplar similar to that described above. The bee was sighted while in the process of tunnelling in a charred poplar log, 16 inches in diameter, the entrance being in a crevice on the east side. This nest was marked and a search for other nests begun. At 5:30 I returned to the first site and was surprised to note that the bee had bored two holes, one being used as an entrance and the other as an exit. The holes were about 1½ inches apart, with one lower than the other. She was in the process of removing sawdust from the lower hole in the following manner. The wood was pushed to the entrance until the hole was plugged. She then backed through the accumulation and scattered it by flailing at it with her hind and mid legs. She continued to back away from the entrance hole and cleared the immediate vicinity of the burrow before re-entering. After leaving the hole the bee entered via the upper. The excavation continued until dark.

On July 20 I was able to re-observe the nest, and noted that the female was in the process of ejecting volumes of sawdust. I cannot be certain that the female was the same one that I noted on July 4, but she was well frayed and examinations showed that the mandibles were well worn. To permit closer examination, the portion of the log covering the nesting tunnel was carefully whittled away and seven cells were exposed. Immediately above the last-formed cell was a side tunnel. This was carefully exposed along its entire length so as to barely expose the side tunnel. The portion of wood was immediately replaced with a piece of glass tubing cut longitudinally. The wood-glass interfaces were sealed with putty and liquid glue. The bee had been in the tunnel at the time of exposure and became somewhat excited at the sudden entrance of sunlight. She left via the entrance hole and flew about the nest for several minutes before re-entering. By the time she returned, the glass had been put in place and the tunnel was once again weather-tight. She inspected the tunnel and removed all of the foreign matter that had fallen in. The larger pieces, which

were unwieldly, were chewed into several smaller fragments before being ejected. She continued tunnelling to a point beyond the end of the first-formed branch. At the end of the tunnel she gathered some of the sawdust chips and tapped them with her legs and head as if forming a footing for the cell to be constructed.

In spite of rain and heavy clouds, she then took numerous short flight about the nest, repeatedly entering and leaving the nest. After about 20 minutes of this she left the locale and returned 24 seconds later with a piece of leaf. This was pulled into the nest and placed about the base and the lower surface of the tunnel. A second piece of leaf, secured from *Ribes* sp., was cut in five seconds and placed in such a position as to cover some of the base and lower lateral portions of the tunnel. The second leaf overlapped the first considerably. A third leaf required 22 seconds to obtain and was much larger than either of the first two cut. This was placed in the latero-basal part of the cell, completing the bottom half of the cell. She then secured six more leaves in 20, 38, 31, 16, 25, and 86 seconds in succession. These were placed about the sides and bottom of the cell with great care and several rearrangements.

At this stage the bee began working diligently about the inner surface of the cell, secreting orally a substance that appeared to be weblike in form. After this weblike base had been deposited over a small area, she laid down a blackish oral secretion that hardened very rapidly. During the process of lining or "insulation," she would emerge periodically and sit on a nearby log. At these times she would manipulate her abdomen in great haste, expanding, contracting, raising, and lowering it for 2 to 4 minutes. After each spell of abdominal manipulation she would enter the burrow and cover some of the inner surface with the dark substance, spending 8 to 21 minutes on the latter act. This sequence of insulating and abdominal manipulating continued for 2 hours and 15 minutes before two more leaves were cut and placed. These, too, were insulated before pollen-collecting commenced.

Seven loads of pollen, mixed with nectar, were deposited in the cell and the egg was laid on the mass. The time required to collect each load was 17 to 38 minutes, 6 of the 7 taking over 25 minutes. Three circular leaf cappings were placed on the cell.

Because of wet weather the nest was not examined again until August 5. Five cells had been formed under the glass, cotton, and

cardboard cover, and the bee was engaged in the construction of the sixth. At this time the glass cover was removed and the four leaf cuttings in place for the sixth cell were disturbed with the point of a pencil. The bee, entering with her fifth leaf, found her work tampered with and began to remove from the tunnel all of the leaves that were out of place. Three were deposited outside the entrance and the fourth was cut up and placed on the top of the last-formed cell of the first tunnel. She began accumulating several new cuttings and the bee was then caught and killed.

The cells were all transferred to a ¼-inch glass tubing in the sequence in which they had been constructed. All of the cells in the main tunnel were placed below the five from the side tunnel. The base of the tube was sealed with paraffin and the apex plugged with cotton batting. It was expected that the last-formed cell would yield the first adult but such was not the case. The tube was kept in the laboratory for the winter, and on April 17 the first male emerged from the last-formed cell of the first-constructed tunnel. In doing so it chewed its way through the five cells above it, damaging, exposing, or destroying all of the pupae above it. On April 18 another male emerged from the cell below that occupied by the first-emerged male, and crawled to the cotton batting plug.The second male destroyed all of the pupae that were still alive. The third male emerged on May 4. Up to the beginning of June none of the four cells below those yielding males had shown signs of viable contents.

In a nest of *inermis* found in a well-decayed poplar log on July 20, two females were working the same hole. One appeared to do nothing except dig and remove sawdust, while the other made frequent collecting trips. The nest was then marked and examined on August to determine whether a bifurcate tunnel was being formed. The tunnel consisted of a short tube no more than four inches long with no secondary branches. In the tunnel there were three cells that had been soaked by rain seeping through the overdecayed log. The nest had probably been vacated after the first rain, for there were several leaf cuttings above the three cells. The cells were opened and three viable larvae in various stages of development were noted. An attempt was made to rear the larvae through to adults by placing each cell in a short piece of glass tube. Two young larvae desiccated on August 16 and a third died on August 20, possibly because of the lack of moisture. None

reached the pupal stage. A similar situation was observed with *frigida*, two females appearing to have a common nesting tube.

REFERENCE

STEPHEN, W. P.
1955. Alfalfa pollination in Manitoba. Jour. Econ. Ent., 48(5):543-548.

ZOOLOGICAL NOMENCLATURE: NOTICE OF PROPOSED USE OF THE PLENARY POWERS IN CERTAIN CASES FOR THE AVOIDANCE OF CONFUSION AND THE VALIDATION OF CURRENT NOMENCLATORIAL PRACTICE (A.(N.S.)25)

Notice is hereby given that the possible use by the International Commission on Zoological Nomenclature of its Plenary Powers is involved in applications relating to the under-mentioned names included in Parts 9 and 10 of Volume 11 of the *Bulletin of Zoological Nomenclature*, both of which Parts will be published on 30th December, 1955. Notice is also given that the possible use of those Powers is involved in one application included in Part 12 (the final Part) of Volume 9 of the same publication, which will be issued in January 1956.

(1) Applications in Part 9 of Volume 11

(1) *Lepisma* Linnaeus, 1758 (Class Insecta, Order Thysanura), attribution of a gender for, in harmony with accustomed usage (Z.N.(S.)988)

(2) Application in Part 12 of Volume 9

(2) Curtis (J.), 1837, *A Guide to an Arrangement of British Insects* (Ed. 2), suppression of, for purposes of selections of type species of genera (Z.N.(S.)298)

Any specialist who may desire to comment on any of the foregoing applications is invited to do so in writing to the Secretary to the International Commission (Address: 28 Park Village East, Regent's Park, London, N.W. 1, England) as soon as possible. Every such comment should be clearly marked with the Commission's File Number as given in the present Notice.—FRANCIS HEMMING, *Secretary to the International Commission on Zoological Nomenclature.*

ERRATUM

In the April issue of the Pan-Pacific Entomologist (Vol. 32), pages 63 and 65 of the Gilbert "Raymondionymine weevils" were inadvertently transposed.

Book Review

CROP PROTECTION by G. J. Rose. Published by Philosophical Library, New York, New York. 1955. 223 pages, 113 figures, frontispiece and 9 figures in color. Price $10.00.

This recently published book, written for the large and small cultivator, purports to be a practical guide to the protection of crops from the initial seed stage to the stored product against the ravages of insect pests, fungus diseases and competing weeds. After carefully reading the sections pertaining to the field of entomology it appears that the above claim is illusory. The book is written in a juvenile style and contains a considerable number of incorrect, incomplete and misleading statements.

On page 22 we are told that "hand picking of the large, clearly visible egg capsules of some insects, e.g. the cotton boll weevil" is a practical control method. In speaking of insect metamorphosis, which is broken down into only two types, complete and incomplete, the author states "sometimes it takes a number of generations for the insect to reach what could be called the mature adult form." Space does not permit listing numerous other incorrect statements but these cited tend to show what appears to be a serious lack of biological and entomological understanding on the part of the author.

The colored figures are ill-chosen with little regard to the importance of the subject illustrated. At least half of them have mistakes in the captions not the least egregious of which are the ones which illustrate sawfly larvae (Hymenoptera) calling them moth larvae and one illustrating the chrysalis of a butterfly as "Hard resistant pupa of a moth."

It is apparent that the author did not avail himself of the voluminous literature which is available on the broad subject implied in the title of the book and at no place is a statement documented by reference to competent authority.

The book is divided into the following sections: (1) general considera-ations, cultural control, types of formulations available; (2) chemical weed killers, insecticides, fungicides, rodenticides; (3) application machinery, choice and operation of equipment and (4) protection of stored products. Four pages are devoted to this latter section and the complete reference to insect pests is a model of brevity completely encompassed in the following quotes "Beetles, moths, some wasps and mites are the main creatures of the insect type which destroy stored products. Flour, wheat, maize, rice, copra, palm kernels, cocoa beans, ground nuts, nutmegs, etc., are all subject to attacks by *Tribolium castaneum*, a flour beetle." His complete reference to microscopic organisms is even more succinct "Rots and moulds are the fungi which damage food in storage and transit."

Printed on what appears to be an inferior grade of paper, the book cannot be expected to hold up well in use. In my opinion, this is not an unmixed blessing.—Woodrow W. Middlekauff, *University of California, Berkeley, California.*

NEW MUSCOID DIPTERA MAINLY FROM CALIFORNIA[1]

H. J. REINHARD
College Station, Texas

The species and genera described in this paper are based upon specimens received from several sources, all cited under the following descriptions. I am indebted to the collectors of this material for the privilege of studying the same.

Euphyto rixosa Reinhard, new species

Easily distinguished from all other known members of the genus by the strongly fasciate and red-tipped abdomen.

Male.—Head pollen subsilvery; front gradually widening upwards and at vertex 0.43 of head width; frontal bristles weak, in two rows converging and stopping at antennal base; one reclinate and two proclinate fronto orbital bristles; ocellars well developed, proclinate; verticals two pairs; frontalia densely pollinose, much wider than one parafrontal on entire length; parafacial bare, three-fourths as wide as clypeus; latter well depressed or dished at middle; epistoma strongly narrowed from clypeus and in forward sloping plane of same; vibrissae weak, set distinctly above epistoma; facialia bare; antenna three-fifths length of face, black third segment a trifle longer than second, latter faintly reddish near apex; arista shorter than antenna, black, bare, thickened on basal two-fifths, proximal segments small; eye bare, large reaching to vibrissal level; haustellum rather slender but not equal to eye length; palpus long and slender, deep brownish to black; cheek about one-fourth eye length; occiput sparsely beset with black hairs. *Thorax* with heavy lusterless gray pollen, scutellum concolorous, notal vittae obsolete. Chaetotaxy: acrostichal 0, 1; dorsocentral 3, 3; intraalar 2; supraalar 2; postalar 2; notopleural 2; presutural 1 (outer); posthumeral 1; humeral 2; pteropleural 0; sternopleural 2; scutellum with 3 lateral (hindmost pair approximated near apex) and 1 discal pair; prosternum, propleuron and postnotal slope bare. Legs largely black, knees and tarsi somewhat reddish, weakly bristled; claws and pulvilli somewhat longer than apical tarsal segment. Wing hyaline, veins yellow; third vein usually setulose half-way to small cross vein; cubitulus angular, bearing a short fold; first posterior cell open well before wing tip; costal spine vestigial; epaulet and subepaulet pale reddish; calypter opaque white; longer than broad. *Abdomen* rather slender, pointed apically, subshiny black the apex distinctly red, last three segments with sharply defined pale gray pollen bands on basal half, which are more or less interrupted along median line; segments three and four each bearing a marginal row of weak bristles; hypopygium red; forceps united, rather short, thin and barely bowed in profile and in rear view tapered from base to a blunt tip, which is slightly notched at middle; fifth sternite with a

[1] Contribution No. 1959, Department of Entomology, Texas Agricultural Experiment Station.

moderate U-shaped apical excision, lobes rather small, black, with one or two good-sized bristly hairs on apical margin; sternites exposed.

Female.—Build stouter and more compact than male; front at vertex 0.46 of head width, widening slightly from middle to antennal base; fore tarsi rather broad and somewhat flattened; claws and pulvilli short; abdomen stouter and thicker than in male; genitalia red, caudoventral, retracted within tip of abdomen, orifice slitlike, with a marginal row of short black hairs. Length, male 5.5 mm.; female, 6–7.5 mm.

Holotype male and allotype female (in Calif. Acad. Sci., Ent.) NILAND, IMPERIAL COUNTY, CALIFORNIA, April 25, 1949, at light, (L. W. Quate). Paratypes: 2 females, Furnace Creek, Death Valley, Calif., April 1, 1951 (P. D. Hurd and J. W. MacSwain); and 1 female, Salton Sea Beach, Imperial County, Calif., April 22, 1951 (E. I. Schlinger).

Phryxe tolucana Reinhard, new species

Similar to the genotype, *vulgaris*, but the front is decidedly more prominent and the apical scutellars are directed backwards.

Male.—Front at vertex 0.35 of head width, hardly widening on upper half then gradually so into facial angle; parafrontal cinereous pollinose to vertex on black background, sparsely haired on outer margin; frontalia dark brown, much narrower than parafrontal; outer verticals divaricate, nearly as strong as inner pair; orbitals absent; ocellars large, proclinate; frontals about twelve in number, with anterior four or five bristles below antennal base; antenna black, second segment about two-fifths length of third, which is rather slender and reaches to oral margin; arista black, bare, thickened on basal two-fifths or less, second segment a little longer than wide; face plumbeous, parafacial bare, narrowed below; vibrissae on oral margin; facialia bristled on about lower fourth; eye sparsely but distinctly hairy, descending to vibrissal level; proboscis shorter than head height; palpus black, spatulate; cheek blackish, thinly pollinose, one-fourth eye length; occiput cinereous, bearing a vestiture of black hairs on outer margin and finer pale pile medianly about neck. *Thorax* and scutellum black, dusted with gray pollen, dorsal vittae not well defined. Chaetotaxy: acrostichal 3, 3; dorsocentral 3, 4; intraalar 3; supraalar 3; presutural 2; humeral 3–4; posthumeral 2; sternopleural 2, 1; pteropleural 1 (small); scutellum with 3 lateral, 1 decussate apical and 1 appressed discal pair; prosternum setose; propleuron and postnotal slope bare. Legs black; hind tibia not ciliate; fore tibia with two median posterolateral bristles; claws and pulvilli a little shorter than last tarsal segment. Wing gray hyaline with a yellow tinge costobasally; second vein with two setulae near base; first posterior cell open well before wing tip; calypter opaque white tinged with yellow. *Abdomen* wholly black in ground color, with gray pollen above which appears dense on only the basal fifth to fourth of segments two and three; latter with erect discals but the hairs depressed; one pair of median marginals on segments one and two and a marginal row on three and four, besides numerous discals on latter; genitalia black; forceps short and

united to middle, grooved behind and tapering to a blunt forward bowed tip; accessory process more shiny, barely half as long or as wide as forceps in profile.

Female.—As described for male but the second antennal segment is fully three-fifths the length of third; orbitals present; palpus much more thickened on apical half; claws and pulvilli shorter; vertex 0.39 of head width; genitalia retracted without piercer. Length, 5.5–7.5 mm.

Holotype male and allotype female (in Calif. Acad. Sci., Ent.) NEVADO TOLUCA, MEXICO, ELEVATION 11,300 FEET, July 11, 1951 (P. D. Hurd). Paratypes: 12 males, same data as type; 1 female, 20 mi. N. Toluca, Mexico, 8,000 feet, July 31, 1954 (Univ. Kansas Mex. Exped.).

Calyptrosomus Reinhard, new genus

Similar to *Leucostoma* in having enlarged calypters, first posterior cell long petiolate and ocellars reclinate but at once distinguished in having the parafacials distinctly clothed throughout with long, coarse black hairs. Also, in the present genus the eyes are noticeably smaller and do not descend so far below the vibrissal level; cheek one-third eye height; antennal axis a little beneath eye middle; parafacial hardly at all narrowed downward and exceeding one-half clypeal width; petiole of first posterior cell reaching costa about length of small cross vein before exact wing tip.

Genotype: *Calyptrosomus dapsilis* Reinhard, new species.

Calyptrosomus dapsilis Reinhard, new species

Male.—Front at vertex 0.17 of head width, slightly narrowed before triangle thence strongly divergent to base of antenna; parafrontal and parafacial gray pollinose, beset with numerous erect hairs; frontal vitta velvety black, equal to or wider than parafrontal on upper half; frontals rather weak, one or two bristles below antennal base; verticals hairlike, outer pair barely differentiated; facialia rather broad and flattened, practically bare; vibrissae slightly above oral margin; antenna rather small, blackish, third segment rounded apically, barely longer than second, arista black, bare, thickened and tapered on about basal fourth; eye bare; proboscis moderately slender but hardly equal head height; palpus brownish, with tip hardly at all thickened and sometimes paler or yellowish; cheek gray, black-haired; back of head lightly gray pollinose on dark background. *Thorax* and scutellum black and moderately shining, weakly bristled as follows: acrostichal 1,1 (none near suture); dorsocentral 2,3; intraalar 2; postalar 2; presutural vestigial; humeral 2–4; pteropleural 1 (small); sternopleural 3; scutellum with 2 lateral and 1 equally strong decussate apical, no differentiated discals; prosternum, propleuron and postnotal slope bare. Legs black; hind tibia with a row of widely spaced uneven bristles on outer posterior edge; claws and pulvilli subequal length of last tarsal seg-

ment. Wing subhyaline, extending beyond apex of abdomen; third vein bearing a single small hair near base; hind cross vein about midway between small cross vein and cubitulus; latter without a stump or fold; costal spine vestigial; hind lobe of calypter noticeably widened, opaque white. *Abdomen* narrower and slightly longer than thorax, shining black, last three segments lightly dusted with gray pollen; hairs on upper surface rather fine and erect but not very long; first segment with one pair of median marginals and a marginal row on each of last three; no differentiated discals; genitalia black, retracted, forceps short, clawlike; sternites covered.

Female.—Front at vertex 0.32 of head width, gradually widening forward into facial angle; parafrontal with only scattered small setae; parafacial not so thickly haired as in male; two proclinate and one reclinate orbital bristles; inner and outer verticals well developed; abdomen wholly shining black, without a trace of pollen, anal segment considerably shorter than preceding one; arms of forceps tapering and curved inward apically; claws and pulvilli shorter than last tarsal segment. Length, 3.5–4.5 mm.

Holotype male, Red Bluff, California, May 22, 1952 (E. I. Schlinger) and allotype female, Davis, California, September 13, 1952 (E. I. Schlinger) in California Academy of Sciences, Entomology. Paratypes: 1 male, Vacaville, California, September 30, 1950 (A. T. McClay), 1 male, San Joaquin County, California, October 29, 1932; 3 males, Amarillo, April 3, 1929 and Mason, April 13, 1952; 1 male, Oklahoma, Beaver County, August 27, 1940; 2 males, Arizona, 10 mi. E. Nogales, March 26, 1955; Butler-Werner and Elfrida, November 5, 1955, G. D. Butler, swept alfalfa and 1 female, Meade, Kans., July 10, 1954, W. L. Downes.

Phorocera arnaudi Reinhard, new species

Traces to *claripennis* in Aldrich and Webber's key (Proc. U. S. N. M., 63, 1924, 45–47), from which it differs mainly in structure of the genitalia; other minor differences are listed below.

Male.—Front at vertex 0.31 of head width hardly widening on upper third thence evenly so downward into facial angle; parafrontal, parafacial, cheek and posterior orbit gray pollinose on dark ground color; frontals in a single row, three bristles beneath antennal base, uppermost two stoutish and reclinate; outer verticals and fronto orbitals not developed; ocellars strong, proclinate; clypeus moderately depressed, epistoma as wide as latter, short; facial ridge bristled to upper fourth or about to level of lowermost frontal; vibrissae on oral margin; antenna about as long as face, black, second segment more or less reddish, about one-fourth as long as third, which is ordinary in width; arista bare, moderately thickened on proximal two-fifths, basal segments short; parafacial bare on entire length, slightly narrowed downward; proboscis short; palpus yellow; cheek barely one-fifth of eye height, clothed with black hairs; eye pilose, reaching nearly to vibrissal level; back of head gray pollinose, bearing a vestiture of wholly

pale or whitish hairs. *Thorax* black rather densely gray pollinose, mesonotum with four velvety black vittae before the suture and five behind, median one only attaining base of the scutellum; later sometimes with apex slightly reddish; acrostichal 3.3; dorsocentral 3.4; presutural 2; sternopleural 3; pteropleural 1 (small); scutellum with 3 lateral, 1 smaller decussate suberect apical pair besides numerous erect bristly hairs over most of upper surface; prosternum setose. *Legs* black, rather slender but not very long; mid tibia with two anterodorsal bristles; hind tibia unevenly ciliate on outer hind side; claws and pulvilli moderately elongated. *Wing* hyaline; first posterior cell open far before extreme wing tip; cubitulus obtuse, bearing a distinct fold in membrane; third vein setulose half-way or more to small cross vein; last section of fifth vein almost to fully one-half length of preceding section; costal spine vestigial; calypter white; epaulet black. *Abdomen* tapered to apex, wholly black in ground color, basal half of last three segments gray pollinose above, and the hind margins polished or shining; two basal segments each with one pair of median marginals, third bearing a complete marginal row; anal segment with a marginal and a discal row behind middle; intermediate segments without discals; genital segments blackish; forceps united, tapering evenly from base to tip as viewed from behind; posterior surface flattened and thickly clothed with fine black hairs except near apex, beak shiny, acute and slightly bowed forward; accessory process broad and shiny on basal part, narrowed before tip and thence widened into a small lobe, which is beset with fine black hairs on outer side; sternites covered.

Female.—Front wider, at vertex 0.37 and at antennal base 0.46 of head width; third antennal segment three times longer than second, which is decidedly more reddish than in male; outer verticals well developed; one reclinate and two strong proclinate fronto orbitals; claws and pulvilli shorter than apical tarsal segment. Length, 6.5–8 mm.

Holotype male and allotype female, CHINO CANYON, PALM SPRINGS, CALIFORNIA, December 22 and 23, 1950 (P. H. Arnaud) for whom the species is named. Paratypes: 2 males, same data as type, except dated December 25 and 27, 1950; 1 male, Hallelujah Junction, Lassen County, California, July 7, 1949 (P. D. Hurd); 1 male, "Utah, July, 1938", and 1 male, Haigler, Nebraska, August 17, 1909 (C. H. Gable);

Phorocera clunalis Reinhard, new species

As described for the preceding species except as follows:

Male.—Front at vertex 0.30 of head width; antenna a little shorter than face, third segment black with reddish tinge on narrow base, slightly exceeding three times length of second, latter reddish; arista thickened on proximal half or more; cheek one-fourth eye height; scutellum reddish except on basal margin; abdomen black with sides broadly reddish, gray pollinose above with a narrow but distinct dark median vitta visible in most views, hind margin of last three segments subpollinose; genital forceps moderately long, united, transversely convex on hind side, tapering from

base to apex in both rear and profile view; beak hardly bowed, subacute. Length, 9.5–11.5 mm. Female unknown.

Holotype male, MISSION, TEXAS, June 29, 1947 and 1 paratype, same data as type, donated by Judson Maguire.

Asseclamyia Reinhard, new genus

Traces to Germariini in Townsend's Manual of Myiology tables but differs markedly from all included forms. Frontal profile subhorizontal and greatly produced, parafacial at antennal base obviously exceeding eye width; antennal axis near eye middle and about one-half longer than oral; vibrissae strong, decussate, nearly length of second antennal segment above oral margin; clypeus narrow and well sunk, slightly arched on median line; facialia subvertical, upper half or more overlapped by parafacial, the exposed lower part beset with small bristly hairs; epistoma hardly narrowed and in clypeal warp, produced and widened downward; parafacial uncommonly broad, twice clypeal width, setose from about middle upwards blending with parafrontal vestiture; vertex 0.43 of head width, gradually widening forward into facial angle; inner verticals not very long but quite distinct; no orbitals; ocellar bristles proclinate; main row of frontals not very stout, lower two bristles divergent on parafacial below antennal base; parafrontal beset with numerous bristles on inner margin and finer hairs on outer along eye margin; antenna about two-thirds as long as face, first segment of moderate length, second one-third as long as third; arista short and bare, proximal segments small; proboscis shorter than head height, haustellum corneous, quite slender and tapering distally, labella smallish but fleshy; palpus slender and barely thickened apically; eye bare, not reaching vibrissal level; cheek fully two-thirds eye height. Thoracic chaetotaxy: acrostichal 3,3; dorsocentral 3,4; intraallar 3; supraalar 3; presutural 2; notopleural 2; posthumeral 2; humeral 3–4; postalar 3; sternopleural 3–5 (normally 4); pteropleural 1 (weak); scutellum with 3 lateral, 1 weak decussate apical and 1 or 2 appressed discal pairs; prosternum setose, propleuron and postnotal slope bare; infrascutellum normally developed. Wing reaching slightly beyond apex of abdomen; first vein bare, third usually with one sometimes two bristlets near base; first posterior cell narrowly open well before wing tip; cubitulus obtusely rounded, without stump or fold; costal spine minute. Legs moderately long but not slender; claws and pulvilli elongate. Abdomen without

discals on intermediate segments; a pair of median marginals on first two and a marginal row on last two segments, besides numerous erect discals on latter; sternites exposed and weakly bristled.

Genotype: *Asseclamyia sphenofrons* Reinhard, new species.

Asseclamyia sphenofrons Reinhard, new species

Male.—Parafrontal, parafacial and cheek gray pollinose on dark background, broad cheek groove red, this color extending upwards on narrow inner margin of parafacial; frontalia opaque black, striate, and widening toward vertex; antenna black, basal segments at times faintly reddish; arista black, shorter than antenna, thickened and tapering on proximal third; palpus brown, somewhat paler near tip; occiput flattened, gray pollinose, clothed with fine pale hairs intermixed with coarser black ones along upper margin. *Thorax* black, with moderately dense gray pollen, dorsal vittae not well defined; scutellum largely red in ground color, lightly dusted with paler or whitish pollen. Wing gray hyaline; veins dark brown; epaulet and subepaulet black; hind lobe of calypter about as wide as long, opaque white. Legs subshining black; hind tibia subciliate. *Abdomen* red in ground color, darker along median line including apex, last three segments extensively gray pollinose above, narrow hind margin of each subshining in direct view; segments three and four bearing a ventral patch of dense appressed black hairs on either side of a shiny black median vitta, which extends to bas of venter; anal orifice large; genitalia wholly retracted. Female unknown. Length, 9.5–11 mm.

Holotype male (in Calif. Acad. Sci., Ent.) TWENTY-NINE PALMS, SAN BERNARDINO COUNTY, CALIFORNIA, March 29, 1952 (R. C. Bechtel). Paratypes: 3 males, same data as type except one dated March 30, 1952 (E. I. Schlinger); and 1 male, Putah Canyon, Yolo County, California, April 15, 1952 (W. J. Wall).

Peleteria aclista Reinhard, new species

Readily distinguished from allied species by the absence of pollen and discal bristles on the intermediate abdominal segments and in genitalic features as mentioned below.

Male.—Head pale pollinose on yellowish background, parafrontals darker or blackish near vertex; frontalia pale reddish yellow and almost equal to parafrontal width; vertex 0.38 of head width; three or four proclinate and one reclinate orbital bristles; outer verticals about as strong as inner; ocellars absent; frontals in two rows, the inner or main row diverging widely on parafacial below antennal base; parafacial beset with black hairs and two or three bristles on lower outer extremity; antenna wholly black, third segment broadly rounded on anterior margin, about three-fourths as long as second; arista black, with moderately elongate subequal basal segments; palpus yellow, very long and slender with the extreme tip noticeably flattened and widened; proboscis slender, haustellum equal head height; cheek about two-thirds eye height, clothed with long black hairs. *Thorax* black, scutellum and posterior calli yellow in ground color, meso-

notum with thin gray pollen which shows four narrow dark vittae in a flat rear view, the inner pair stopping shortly behind suture and outer ones broadly interrupted at same; acrostichal 3,4; dorsocentral 4,4; presutural 2; sternopleural 3; pteropleural 2 (large); scutellum with 4 lateral, 1 preapical, 1 decussate apical and numerous suberect discal bristles. Legs black, tibiae more or less reddish, strongly bristled; claws and pulvilli not much longer than apical tarsal segment. Wing gray hyaline tinged with yellow basally; veins including costa yellowish; apical cell narrowly open far before wing tip; apical and hind cross veins in same plane and very oblique, latter joining fourth vein much nearer to cubitulus than small cross vein; calypter opaque yellowish white; epaulet yellow. *Abdomen* reddish yellow fourth segment sharply contrasting black in general aspect, entire upper surface devoid of pollen but the surface not shiny; second segment with one pair of median marginals, third with a complete marginal row and the fourth beset with numerous bristles on apical half above; genitalia blackish, posterior forceps grooved along median line behind, bowed forward and suddenly narrowed near apical third terminating in a short median beak; fifth sternite nearly as in *iterans;* sternites two to four yellow, exposed apically and beset with black hairs and bristles.

Female.—Vertex 0.42 of the head width; second antennal segment slightly reddish at extreme apex; otherwise except for sexual differences similar to male. Length, 10–12 mm.

Holotype male and allotype female, Mt. Popocatepetl, 3000 m. Mexico, November 27, 1951 (W. G. Downs). Paratypes: 2 males, Nevado Toluca, Mexico, Mexico, 11,300 ft., July 11, 1951 (P. D. Hurd) in the California Academy of Sciences, Entomology; 2 males, north slope, Popocatepetl, Mex., Mexico, 1,300 ft., VII-11-54 (Univ. Kansas Exped.); and 1 male, west slope Cortes Pass, Mexico, 11,500 feet, VII-11-54 (Univ. Kansas Mex. Exped.).

DESIGNATION OF A TYPE SPECIES FOR THE GENUS EOPARARGYRACTIS LANGE

(Lepidoptera: Pyralidae, Nymphulinae)

In a recent revision of the aquatic moths[1] the genus *Eoparargyractis* was proposed to receive three known North American species, *E. plevie* (Dyar), *E. irroratalis* (Dyar), and *E. floridalis* Lange. Inasmuch as a type species was not selected I would like to designate the following: *Type Species: Elophila plevie* Dyar, 1917.[2]—W. H. Lange, Jr., *University of California, Davis.*

[1] W. Harry Lange, Jr., 1956, A generic revision of the aquatic moths of North America: (Lepidoptera: Pyralidae, Nymphulinae). The Wasmann Jour. of Biology, 14(1):125.

[2] H. G. Dyar, 1917, Notes on North American Nymphulinae. Insec. Inscit. Menst., 5(4-6):78.

FURTHER NOTES ON THE TAXONOMY AND BIOLOGY OF THE ANDRENINE BEES ASSOCIATED WITH OENOTHERA

(Hymenoptera: Andrenidae)

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Since the publication of observations on the nesting habits and flower relationships of three superficially similar species of *Andrena* which were collecting pollen from *Oenothera dentata* var. *johnstonii* in Short Canyon, on the western edge of the Mojave Desert near Inyokern, Kern County, California (Linsley, MacSwain and Smith, 1955), an opportunity has been afforded to make observations on a similar complex of species in a Mojave Desert locality near Little Rock, Los Angeles County, California. Although the new observations are not as extensive as we would have liked, they are offered in the hope that some useful comparisons between the two ecological situations can be made. The dominant species at the Little Rock Site were *Andrena oenotherae* Timberlake and *A. flandersi* Timberlake, although *A. foxii* Cockerell and an undetermined species were present in smaller numbers.

TAXONOMIC NOTES

Onagrandrena Linsley and MacSwain, new subgenus

Medium sized species of *Andrena;* integument black, occasionally partially red or tinted with reddish or bluish; pubescence of females black or blackish-brown, of males predominantly white.

Female—Head with facial foveae wide, upper ends occupying most of distance between eye and lateral ocellus, lower ends narrower, scarcely extending below level of antennal insertions; process of labrum usually reflexed and emarginate at apex, occasionally with produced apex long and slender. Thorax with pleura coarsely punctured; propodeum usually coarsely sculptured, enclosure well-defined, finely rugulose to coarsely rugose; propodeal corbicula poorly developed; wings lightly tinted with black to heavily infuscated, anterior pair with three sub-marginal cells (rarely two), first recurrent nervure ending beyond middle of cell; legs with tibial scopa long, loose, hairs of outer face simple. Abdomen with terga distinctly punctate, posterior impressions without hair bands, frequently with impunctate margins.

Male—Head with facial quadrangle usually longer than wide; clypeus concolorous with integument of rest of face. Thorax with hairs of dorsum white or predominantly white (rarely bright reddish); wings lightly tinted

[1] The authors gratefully acknowledge the assistance of James M. Linsley in the collection of field samples of bees. Flower identifications, as for our earlier study, were provided by Helen K. Sharsmith of the University of California Herbarium.

with black to heavily infuscated, anterior pair with three sub-marginal cells (rarely two).

Type of subgenus: *Andrena oenotherae* Timberlake.

This subgenus is proposed for a group of closely related species which, in so far as is now known, collect pollen only from *Oenothera* or other onagraceous plants. *Onagrandrena* is closely related to *Diandrena*, and the latter subgenus was presumably derived from it or from a common ancestral stock. Both groups are limited to the area from the Rocky Mountains westward. Further, at least five species of *Diandrena*, including *A. (D.) sperryi* Cockerell, *A. (D.) cyanosoma* Cockerell and *A. (D.) parachalybea* Viereck, collect pollen from *Oenothera* or other Onagraceae (Timberlake, in litt.). Cockerell (1937) has previously called attention to the fact that the tibial scopa is composed entirely of long simple hairs in the species of *Diandrena* associated with onagraceous flowers.

Lanham (1949) assigned this group of species to *Melandrena* and we have followed him in our recent treatment (Linsley and MacSwain, 1955). However, the *Oenothera*-visiting species do not seem to us to be closely related to either the Old World *Andrena morio* Brullé, which Hedicke (1933) designated as the type of *Melandrena* Pérez (1890) or to the North American *Andrena nigra* Provancher, which Lanham also assigned to *Melandrena*. Both of these species have a compact tibial scopa and facial foveae which extend well below the antennal insertions. *A. (M.) morio* visits crucifers and filaree (Friese, 1926), as well as *Anchusa* and *Centaurea* (Schmiedeknect, 1930); related species visit *Salix*, *Taraxacum*, *Brassica*, and *Sisymbrium*. *A. nigra* collects pollen from *Phacelia* (Linsley and MacSwain, 1955).

In addition to the species mentioned below, the following should be assigned to *Onagrandrena: A. (O.) prima* Casad, *A. (O.) anograe* Cockerell, *A. (O.) blaisdelli* Cockerell, *A. (O.) rozeni* Linsley and MacSwain, *A. (O.) rubrotincta* Linsley, *A. (O.) linsleyi* Timberlake, *A. (O.) mojavensis* Linsley and MacSwain, *A. (O.) deserticola* Timberlake, *A. (O.) vanduzeei* Linsley, and *A. (O.) omninigra* Viereck.

ANDRENA (ONAGRANDRENA) OENOTHERAE Timberlake

As we have indicated previously, *A. (O.) oenotherae* as identified by us either is an unusually variable species or a complex of closely related forms which we have been unable to segregate. The

Little Rock specimens, like those from the population in Short Canyon, vary in size, in the length and shape of the process of the labrum, the sculpture of the enclosure of the propodeum, and the punctures and shininess of the mesoscutum. In typical examples of *oenotherae*, the apex of the labral process is distinctly longer than broad, narrowed near the base. Of 57 females from Little Rock assigned by us to this species, only 13 have this type of labral process. These individuals are also somewhat larger, ranging in wing length from 8.6–9.6 mm., as against a range of 8.1–9.1 mm. for the remainder. However the mean wing lengths differs only by 0.2 mm. (9.0:8.8 mm.). Since the longer process of the labrum is associated with individuals in the larger size range, it is possible that heterogony is involved. However, all of the variations mentioned run to *oenotherae* in our recent key to the species of the subgenus (Linsley and MacSwain, 1955).

ANDRENA (ONAGRANDRENA) SPECIES

Two female specimens from the Little Rock locality have been set aside as probably representing an undescribed species. They are of the size and form of *A. (O.) flandersi* but differ in the narrow impunctate margin of the metasomal tergites.

ANDRENA (ONAGRANDRENA) FOXII Cockerell

Andrena foxii Cockerell (1898) was assigned by Lanham (1949) to the subgenus *Diandrena*, presumably because the wings have only two submarginal cells and the integument, although black, has a metallic bluish cast. The species actually exhibits a number of structural characters of both *Diandrena* and *Onagrandrena* and might well be regarded as an intermediate type. However, the aspect of both sexes is that of the latter subgenus and since its biological characteristics also suggest such a relationship, we prefer this subgeneric assignment.

Although we identify our specimens with some confidence with the females described by Cockerell, Cresson (1928) unfortunately selected the male, which was only briefly characterized by Cockerell, as the type. Therefore, our identification rests on the assumption that the sexes were correctly associated by Cockerell.

ANDRENA (ONAGRANDRENA?) PHENAX Cockerell

A. phenax Cockerell (1898) could not be subgenerically assigned by Lanham (1949) on the basis of the original description. However, if *A. foxii* is accepted as an *Onagrandrena* with two submarginal cells, then it is probable that *A. phenax*, which

shares this and other characters, merits the same assignment. The type is from southern California. Notes made some years ago distinguish the females of these two species as follows:

— Mesoscutum slightly shining, surface tessellate, with large, coarse, irregularly placed punctures intermixed with smaller ones, varying from one to several puncture widths apart, pubescence sparse, moderately short; process of labrum with apex very narrowly rounded.....*phenax*

— Mesoscutum dull, surface tessellate, with very fine, indistinct punctures, pubescence long, erect, dense; process of labrum with apex emarginate, more or less bilobed.....*foxii*

Andrena (Onagrandrena?) stictigastra Viereck

A. stictigastra Viereck (1916), described from southern California, was also placed by Lanham (1949) in a list of species of uncertain position. From a study of the original description it would appear that it might well belong to the group of *Oenothera* monoleges here assigned to *Onagrandrena*. Viereck describes the species as "black, covered throughout with black or blackish brown hairs," the propodeum with the "enclosure well defined, coarsely sculptured in addition to having at least five well-defined longitudinal carinae on each side of a median longitudinal carina," the wing membrane "with a uniform blackish brown tinge." Although these characters are strongly suggestive of affiliation with *Onagrandrena,* the combination of small size (9.5 mm.), "dark brownish hairs on the mesopleurae," the "dorsulum dullish, finely reticulated, coarsely punctured, the punctures from nearly adjoining to six puncture widths apart, the punctures mostly sparsely distributed," and other features indicate that it is probably different from any of the subsequently described species which are now placed in this subgenus.

Biological Notes

HABITAT

The *Onagrandrena* site which provided the observations here recorded is one mile west of Little Rock, Los Angeles County, in the western part of the Mojave Desert just north of the San Gabriel Mountains. The site is relatively flat and extends along both sides of a wash which is crossed by State Highway 138, the main thoroughfare from Palmdale to Little Rock. The area covered by us was about one-half mile wide and about three-quarters of a mile long. In this section the soil is a coarse sand with some gravel on the surface and buried rocks and small boulders which became more numerous as the lower levels of the

bee burrows were excavated. At the time of our study (April 23–28, May 12–15, 1956) the sand was moist from immediately below the surface to a depth of at least two feet.

As in the Short Canyon *Onagrandrena* habitat described previously (Linsley, MacSwain and Smith, 1955) there were scattered plants of *Larrea glutinosa* (creosote bush) and *Yucca brevifolia* (Joshua tree), and a perennial composite, *Encelia farinosa*, was abundant in both places. However, the species of *Oenothera* were different in the two sites. The pollen source for *Onagrandrena* near Little Rock was *Oenothera contorta* var., which closely resembles the Short Canyon pollen source, *O. dentata* var. *johnstonii*, in growth form (mostly 1–4 inches high), flower color (yellow), and flower size (½–¾ inch in diameter). However, unlike *O. johnstonii* which opened before sunrise, *O. contorta* did not open until the sun reached the flowers and, if the temperature was cold, not until the plants had been in the sun for some time. This fact markedly influenced the period of activity of the bees. A second yellow-flowered species *(O. micrantha)* with smaller blossoms was also abundant but only once was a female of *Onagrandrena* seen to visit this plant and it was not clear that pollen was taken on that occasion. A species with large white flowers *(O. californica)*, although common, was ignored by *Onagrandrena*, but a few honeybees were seen gathering pollen from it. A major difference in the floral environment of the two areas was the great abundance of *Coreopsis californica* in the Little Rock site. These exceeded the flowers of *Oenothera* in numbers by approximately ten to one, and provided a ready source of nectar for the species *Onagrandrena*. A large number of females were captured while taking nectar from this plant. *Oenothera contorta*, although apparently an adequate pollen source for *Onagrandrena*, does not appear to produce as much pollen as *O. johnstonii*, at least as judged by the number of visits required to obtain a pollen load and the size of the loads carried by the bees which were captured.

The weather at the Little Rock site was extremely variable during the few days devoted to this study. In the period of April 23 to 28 there were no clear, warm mornings without wind. From May 12 to May 15, the morning sky was clear but again there was a strong east wind on May 12 and 14. This wind, which blew from the snow-covered San Gabriel Mountains, was cold and had a

delaying effect upon the opening of the *Oenothera* flowers and the emergence and other activities of the bees.

ANDRENA (ONAGRANDRENA) OENOTHERAE Timberlake

A. (O.) oenotherae was the largest and most abundant species of *Onagrandrena* found at the Little Rock locality and 57 females were collected. Of these, 23 were gathering pollen from *Oenothera contorta* var., 31 were taking nectar from flowers of *Coreopsis californica* and three were trapped in wire cones placed over burrows. The larger size of the females which we identify as *A. oenotherae* permitted recognition of the species in the field. The following account of its activities is based upon these 51 females and a smaller number which eluded capture.

Females were found to exhibit three principal behavior patterns. First, and particularly on the colder mornings, they emerged from their burrows and remained motionless on the ground in the sunlight. In this position they were seldom seen until they flew off as they were approached (none of these were captured). Within a few minutes after their first appearance on the ground, individuals were found gathering pollen from *Oenothera* flowers. The earliest pollen collecting female was seen at 6:45 a.m. on May 14, and the latest at 9:29 a.m. on May 12. The maximum time during which females were captured while gathering pollen on a given day was from 6:45 to 8:52 a.m. on May 14. On the previous day, which was colder, pollen collecting individuals were seen from 7:14 to 8:51 a.m. As mentioned above, the flowers of *Oenothera contorta* do not appear to produce as large a quantity of pollen as those of *Oenothera dentata* var. *johnstonii*, and females of *oenotherae* not only worked more flowers to obtain a pollen load than was true in Short Canyon, but the completed loads appeared smaller. Furthermore, the large numbers of *Coreopsis* flowers growing intermixed with *Oenothera* interfered with pollen gathering, since the bees also approached them for purposes of identification. Under these conditions, *A. (M.) oenotherae* were easily collected, although a few escaped capture in strong gusts of wind.

About an hour after the appearance of the first pollen-gathering bees, females (without pollen) were observed taking nectar from the flowers of *Coreopsis*. This characterized bee activity for about an hour after the last pollen-collecting female was seen. Between April 24 and April 28, more bees were found taking nectar than

gathering pollen; between May 12 and 15, the reverse was true. However, nectar-gathering bees were the more active and difficult to capture.

Females of *A. (O.) oenotherae* became active about the flowers near Little Rock about an hour later than in Short Canyon and activity extended for a longer period into the day. This difference may reflect a conditioning effect resulting from the different diurnal flowering behaviour of the two principal species of *Oenothera* and perhaps also the adaptability of this widely distributed bee.

Three burrows of the atypical form of *A. oenotherae* were located on May 14 and, after the capture of the bees, were filled with plaster of Paris. Excavation of the casts proved difficult because of the gravel and rocks encountered. Fortunately, only minor variations in the burrows were associated with rocks and the three casts were very similar in shape. Each was excavated on

Fig. 1. Burrow diagram and cell arrangement in *Andrena (Onagrandrena) oenotherae* Timberlake, 1/5 natural size.

one side and measured *in situ* before removal. The burrows were about 7 mm. in diameter and slanted down from the surface of the ground to a depth of from 11 to 14 centimeters at an angle of about 45 degrees. From this point, they progressed vertically to a depth of 36 to 47 centimeters and then laterally for 12 to 20 centimeters where a horizontal open cell had been formed. Further excavations revealed a number of completed cells in the near vicinity, but since the tunnels connecting these with the lateral branch of the burrow had been plugged with sand, the exact relationship of these with the burrow can only be suggested (Figure 1). However, each cell was placed horizontally, measured about 14 mm. in length and 8 mm. in diameter, and contained a slightly flattened, spherical ball of *Oenothera* pollen. No larvae were found in the seven completed cells excavated and presumably only eggs were present.

A species of *Stylops* parasitic on *A. oenotherae* was also collected. Of three stylopized females (atypical form) taken on the flowers of *Coreopsis* on April 28, two contained a single female *Stylops* each, the third two female *Stylops*. First instar larvae were emerging from all of the female *Stylops* and continued to do so for several days after the bees had been killed in cyanide. The dorsal apex of the abdomen of each of the stylopized bees was covered with pollen grains of *Oenothera*.

ANDRENA (ONAGRANDRENA) FLANDERSI Timberlake

Seventeen females of *A. (O.) flandersi*, one of the smallest species now known in the subgenus, were collected at the Little Rock locality. Twelve of these were captured between April 25 and 27, four gathering pollen from *Oenothera contorta* var., eight taking nectar from flowers of *Coreopsis californica*. Five females found on May 12 and 13 were each taking *Oenothera* pollen. Our observations are limited to these 17 captured specimens since females of this species could not be distinguished in the field from those of *A. (O.) foxii* Cockerell or the undetermined species mentioned below. Although the number of individuals of *flandersi* collected was small, a comparison of the times of capture with those of *A. oenotherae* on the same days is of interest.

On April 25, after searching for bees from 5:00 until 6:00 a.m. without success, the area was left and then revisited at 8:30 a.m. At this time a number of bees were on the flowers of *Oenothera* and *Coreopsis* and the following four collections of

females of *oenotherae* and *flandersi* were made: from 8:30 to 8:50 a.m. (first collector) three *oenotherae* (1 with *Oenothera* pollen, 2 taking *Coreopsis* nectar) and three *flandersi* (all with pollen); from 8:30 to 9:15 a.m. (second collector), six *oenotherae* (all taking nectar) and one *flandersi* (taking nectar); from 8:50 to 9:20 a.m., two *oenotherae* (taking nectar) and two *flandersi* (1 with *Oenothera* pollen, 1 taking nectar); from 9:20 to 9:35 a.m., three females of *flandersi* (all taking nectar).

On April 26 at 6:10 a.m., the sky was overcast and the air was warm but by 7:36 a.m. it had turned quite cold, with intermittent showers. Only two bees were collected as follows: a female of *A. oenotherae* gathering *Oenothera* pollen at 7:12 a.m. and a female of *flandersi* inactivated on the ground at 8:19 a.m.

On April 27, at 6:10 a.m. it was clear and sunny but a cold wind was blowing from fresh snow deposited in the San Gabriel Mountains the previous day. Although the *Oenothera* flowers were fully opened by 7:45 a.m., the first bee was seen in flight at 9:11 a.m. Subsequently three bees were collected while taking nectar as follows at 9:16 a.m., a *flandersi* female, at 9:23 a.m., an *oenotherae* female, and at 9:26 a.m., a *flandersi* female. At 9:29 a.m., a female was seen in flight but no others were observed by 10:00 a.m. The following morning the area was visited between 7:00 and 8:30 and only *oenotherae* females were seen and collected. Three of these were stylopized, three were gathering pollen from *Oenothera* at 7:27, 8:01 and 8:09 a.m. and one was taking nectar from *Coreopsis* at 7:52.

The collections made in May suggest that *A. oenotherae* flies earlier in the day and may fly during weather conditions unsuitable for the smaller *A. flandersi*. On May 12, the area was visited at 8:30 a.m. and, although only a portion of the *Oenothera* flowers were open and a cold wind was blowing, six females of *A. oenotherae* and two of *flandersi* were collected. Five of the *oenotherae* were gathering pollen at 8:37, 8:42, 8:46, 8:52 and 9:29 a.m.; the sixth was caught at *Coreopsis* at 9:30 a.m. The two females of *flandersi* were collecting pollen when captured at 9:52 and 9:57 a.m. and other bees were seen later than this time. On May 13, there was almost no wind and bees were first observed at about 7:15 a.m. when only a portion of the flowers were open. These and the other bees seen and captured before 9:26 a.m. were recognized by their size to be females of *A. oenotherae*. Fourteen

of these (six with pollen at 7:15, 7:20, 7:47, 8:08, 8:44, 8:51 and eight with nectar at 8:09, 8:14, 8:18, 8:27, 8:34, 8:47, 9:04, 9:13) were collected. The next two bees encountered were females of *A. flandersi* taking pollen at 9:26 and 9:28 a.m. Another female with pollen was the last bee seen and collected at 10:07 a.m. In this last interval, however, two *oenotherae* were found taking nectar from *Coreopsis* at 9:20 and 9:59 a.m. On the morning of April 14, there was a strong, moderately cold east wind and although no females of *flandersi* were seen, eleven *oenotherae* were collected and a number of others seen. Seven of these bees, including the first at 6:45 a.m. and the last at 8:52 a.m., were gathering pollen, three were taken from *Coreopsis* and one as it emerged from its burrow at 7:05 a.m.

Several small burrows with vertical entrances were discovered too late to capture and identify their occupants or to investigate their structure. It is likely that they were the burrows of *A. flandersi* or of one of the other two small species known to occur in the area.

Although no males of *flandersi* were taken at Little Rock, two males and one female were collected at the Short Canyon site on April 12, 1954 (Linsley, MacSwain and Smith, 1955).

ANDRENA (ONAGRANDRENA) FOXII Cockerell

A. (O.) foxii is the only species of *Onagrandrena* from Little Rock of which males were collected. One of these was captured between 8:50 and 9:20 a.m. on April 25, the other at 7:11 a.m. on April 26. On April 28, a female was collected at 7:28 a.m. while gathering pollen from *Oenothera contorta* var., another while taking nectar from *Coreopsis californica* at 7:45 a.m. Although definite conclusions cannot be drawn from this sample, it should be noted that on April 28 the first female of *A. oenotherae* gathering pollen was collected at 7:27 a.m., the first individual taking nectar from *Coreopsis* was taken at 7:52 a.m. This suggests that *A. foxii*, unlike *flandersi* which appears later in the morning, may have a diurnal pattern of activity like *A. oenotherae*. However, the presence of the two males is puzzling since, in general, the species of *Onagrandrena* which appear latest in the season usually visit flowers latest in the day. It is possible that males of this species are long lived (the wings of both males are frayed), a characteristic that we have also observed in several species of the subgenus *Diandrena*. It should also be pointed out that in *Dian-*

drena, as in *Onagrandrena*, it is not uncommon to find a number of species collecting pollen from the same species of plant in the same locality (e.g., the complex of species associated with *Ranunculus*).

ANDRENA (ONAGRANDRENA) SPECIES

Two females of this species were collected on the flowers of *Coreopsis californica* on April 25. One was taken between 8:30 and 8:50 a.m., the other between 8:30 and 9:15 a.m. Although neither had pollen grains of *Oenothera* it is almost certain that this species also collects pollen from this source.

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NOTES ON AN OSMIINE BEE NESTING GALLERY IN A PINE CONE

(Hymenoptera: Megachilidae)

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A series of cones were collected on October 21, 1955, from a jeffery pine near the Wrightwood entrance to the Angeles National Forest, Los Angeles County. One of these cones was split open and a gallery of the osmiine bee *Osmia coloradensis* Cresson[2] was exposed in the pith of the cone, fig. 1. The gallery consisted of

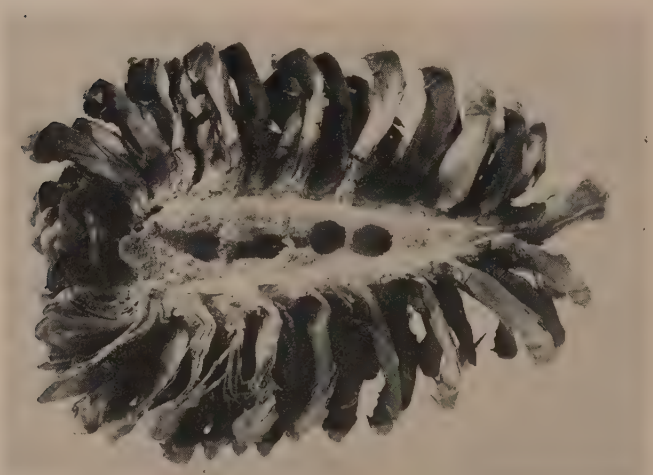

Fig. 1. Gallery and cells of *Osmia coloradensis* Cresson in a cone of *Pinus jeffreyi*.

three cells. The cell nearest the apex of the cone contained a bee adult, the central cell contained a bee pupa, and the basal cell contained a bee larva with the remains of a pollen ball, apparently the food supplied by the parent bee. The entrance of the gallery at the base of the cone was plugged with what appeared to be macerated pine needles.

[1] Studies of the cone and seed insect problems in the California pine region made possible by a grant from the Albert M. Walker Foundation.

[2] Determined by P. D. Hurd, Jr., University of California, Berkeley.

TWO NEW CRANE-FLIES FROM POINT BARROW, ALASKA

(Tipulidae: Diptera)

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In the survey now in progress covering the Tipulidae of the Yukon and Alaska, a number of important lots of specimens from various sources have been received. At this time it seems advisable to describe two forms from Point Barrow and vicinity, taken by Dr. Paul D. Hurd and Dr. Neal A. Weber, to whom my thanks are extended for the privilege of naming the materials.

Prionocera gracilistyla Alexander, new species

Belongs to the *serricornis* group; nasus lacking or reduced to a tubercle; male hypopygium with the dorsal tergal lobes relatively small, with abundant short curved setae, lateral lobes slender, median lobe low and convex; outer dististyle very broad across its base, narrowed outwardly; inner style unusually slender, especially the rostral portion.

Male.—Length about 11–13 mm.; wing 13–15 mm.; antenna about 3.6–4 mm. *Female.*—Length about 15–21 mm.; wing 15–19 mm.

Nasus lacking or reduced to a small tubercle; frontal prolongation of head uniformly darkened; palpi black. Antennae black throughout, in male the basal three flagellar segments strongly serrate, the succeeding ones less evidently so; in female, flagellar segments less distinctly serrate, pedicel and most of the first flagellar segment conspicuously yellowed. Head above dark gray, with a conspicuous dark median stripe; vestiture long and pale. *Pronotum* dark brownish gray. Mesonotal praescutum and scutum dark gray, the former with three darker plumbeous stripes, the median one more or less distinctly divided in front by a capillary darker line; scutellum and postnotum lighter gray, with a capillary dark median vitta; thoracic vestiture long and conspicuous. Pleura gray; dorsopleural membrane buffy brown. Halteres with stem brownish yellow, knob dark brown. Legs with the coxae and trochanters dark gray; femora brownish yellow, the tips narrowly dark brown; tibiae brownish yellow, the tips more broadly blackened; tarsi black; claws of male small, toothed. Wings grayish subhyaline, cell *Sc* and stigma yellowish brown, cell *C* somewhat paler; a more or less distinct darkened cloud in bases of outer radial cells beyond the anterior cord; veins brown, *Sc* and veins near arculus paler. Veins, with the exception of *R*, glabrous. Venation: Cell M_1 usually short-petiolate to almost sessile, the longest petiole about one-half *m*; in one female, the petiole is longer than *m*. *Abdominal tergites* dark gray, with a broad continuous brown median stripe, ending on the seventh segment; lateral borders broadly, posterior margins very narrowly, yellowed; sternites dark gray, the posterior borders very narrowly yellow; dististyles of hypopygium fulvous. Male hypopygium with the dorsal tergal lobes relatively small, as compared with *parrii* and *serri-*

cornis, a little dilated outwardly and extended mesad, partly closing the median notch: margins of lobes with abundant relatively short curved setae; lateral tergal lobes slender, median lobe low, convex. Outer dististyle very broad across base, narrowed outwardly, the apex obtuse. Inner dististyle unusually slender, especially the produced rostral portion, this with several small blackened setigerous punctures along ventral part before the slightly expanded apex.

In *parrii*, the dorsal tergal lobes are very broad, the notch correspondingly narrowed; apices of lobes obliquely truncated, with relatively sparse small setae; lateral tergal lobes low. Outer dististyle not conspicuously widened across base, very gradually narrowed to the broadly rounded tip. Inner dististyle with the beak only moderately produced, the dilated basal part of style not unusually narrow.

Holotype, male, POINT BARROW, ALASKA, June–August, 1950 (N. A. Weber), Collector's No. 2644; United States National Museum. *Allotopotype*, female, July 27, 1949 (Weber), No. 2514. *Paratopotypes*, 8 males and females, July 10–23, 1952 (P. D. Hurd).

From the other Arctic species of the *serricornis* group that have the median line of the praescutum darkened, including *Prionocera lackschewitzi* Mannheims, *P. parrii* (Kirby), and *P. serricornis* (Zetterstedt), the present fly differs evidently in the structure of the male hypopygium, including the tergite and both dististyles. Earlier (Canadian Arctic Expedition 1913–18, 3 C: 8c–9c; 1919), I had identified materials from the Northwest Territories of Canada as being *parrii*, otherwise known from Melville Island and Greenland. There has been no opportunity to examine the type of this species and for the time being it seems best to consider this earlier determination as being correct. There seems to be no doubt of the distinctness of these two Arctic species of *Prionocera* in Alaska.

PEDICIA (TRICYPHONA) HANNAI (Alexander)

Tricyphona hannai Alexander; North American Fauna, 46:160–161, pl. 10 (fig. 1 (venation), pl. 10, fig. 6 (♂ hypopygium); 1923.

The type, a male, was from St. George Island, Pribilof Islands, Alaska, taken June 10, 1914, by G. Dallas Hanna.

Pedicia (Tricyphona) hannai antennata Alexander, new subsp.

Generally as in the typical race, as cited above, but fully-winged in the male sex, the wings greatly reduced in the female. Differences in the length and degree of slenderness of the legs are

correlated with the reduction of the wings. The male hypopygium is virtually identical in both forms.

The antennae in the unique type of typical *hannai* were not clearly discernible. In the present fly, this organ is exceedingly reduced, there being only five or six separate segments; the basal fusion-segment is large and massive, with two or three unfused segments beyond, the last being the longest. Wing venation of male similarly variable, normally with R_2 longer than R_{1+2}; R_3 entire; R_{4+5} long-fused, subequal in length to cell R_4; cell *1st* M_2 closed; cell M_1 present, from twice to three times its petiole. In cases, the tip of R_3 is atrophied and cell M_2 is open by the atrophy of M. In still more abnormal specimens, still other veins are deformed or atrophied at their tips. In the female, the wings are reduced to short, strongly infuscated stubs, about 2.5 to 3 times as long as wide, the venation totally distorted.

Holotype, male, POINT BARROW, ALASKA, June–August, 1950 (N. A. Weber), Collector's No. 2641; United States National Museum. *Allotopotype*, female, July 27, 1949 (Weber), No. 2515. *Paratopotypes*, male and female, June–August, 1950 (Weber), Nos. 2640, 2641, 2644; 18 males and females, July 7–23, 1952 (P. D. Hurd); July 27–30, 1949 (Weber), Nos. 2515, 2528, 2534. *Paratypes*, 1 male, West Anaktuvuk Pass, 68°, 20′ N. Lat., 151°, 30′ W. Long., 1949 (Weber); 1 male, Umiat, Upper Colville River, Alaska, 68° N. Lat., 160° W. Long., 1950 (Weber), Collector's No. 2605.

RELEASES OF RECENTLY IMPORTED INSECT PARASITES AND PREDATORS IN CALIFORNIA—1954-55

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The following list, reporting the first field releases of imported species of parasites and predators by the Department of Biological Control, supplements a preceding report[1] covering the years 1952 and 1953. The year of first release is 1955 unless otherwise indicated.

Several species listed in the 1952-53 report under the generic name only have since been named or identified as follows:

Bothriocraera sp. = *Bothriocraera bicolor* Compere and Zinna
Haltichella sp. = *Hockeria rubra* (Ashmead)
Horogenes sp. = *Horogenes molestae* (Uchida)
Pseudaphycus sp. = *Pseudaphycus perdignus* Compere and Zinna

Host and Parasites or Predators	*Origin*	*Area or County of Release*
MYELOIS VENIPARS Dyar		
Phanerotoma dentata (Panzer)*[2]	France	Riverside
NOCTUIDAE (various armyworms and cutworms)		
Euplectrus plathypenae Howard	Texas	Southern California, Monterey
Incamyia chilensis Aldrich	Chile	Riverside, Kern
CIRCULIFER TENELLUS (Baker)		
Aphelinoidea sp. "M"*	Morocco	San Joaquin, Antelope, and Imperial Valleys
Aphelinoidea sp. "O"*	Morocco	"
Aphelinoidea sp. "S"*	Spain	"
Lymaenon sp. "E"*	Egypt	"
Lymaenon sp. "Y"*	Egypt	"
Oligosita sp. "E"	Egypt	"
THERIOAPHIS MACULATA (Buckton)		
Aphelinus semiflavus Howard	Europe	Southern California, San Joaquin Valley
Praon palitans Muesebeck	Europe, Near East	"
Trioxys utilis Muesebeck	Europe, Near East	"
APHIDIDAE (various)		
Aphelinus toxopteraphidis Kurdjumov*	Hong Kong	Orange, Ventura, Monterey
Aphidius sp.*	Europe	Sutter, Monterey
Chilomenes sexmaculata (Fabricius)*[2]	India	General
COCCUS HESPERIDUM Linnaeus		
Metaphycus sp. "C"*	South China	Tulare
SAISSETIA OLEAE (Bernard)		
Hyperaspis globosa Casey	Mexico	Southern California
AONIDIELLA AURANTII (Maskell)		
Aphytis immaculatus Compere	Formosa	Orange, San Diego
Pentilia sp. near *nigella* Weise	Mexico	Southern California
Pentilia sp.	Honduras	"
ASPIDIOTUS LATANIAE Signoret		
Spiliconis picticornis Banks*	Hong Kong	

LEPIDOSAPHES BECKII (Newman)		
Aphytis immaculatus Compere*	Formosa	Orange, San Diego
Prospaltella sp. near *elongata* Dozier*	Iran	Riverside
PLANOCOCCUS CITRI (Risso)		
Acroaspidia myrmicoides Compere and Zinna[3]	Trinidad	Ventura
Brumus suturalis (Fabricius)[2]	Pakistan	San Diego, Santa Barbara
TETRANYCHIDAE AND ERIOPHYIDAE (various)		
Stethorus punctillum Weise	Turkey	Ventura, San Diego
Stethorus sp.	Guatemala	Southern California
Typhlodromus floridanus Muma	Guatemala	"

* First releases made in 1954.

[1] Pan-Pacific Entom. 31, 2, 90-92, 1955.

[2] Received from Entomology Research Branch, U.S.D.A.

[3] Received from Commonwealth Institute of Biological Control, Fontana, California.

BOOK REVIEW

THE PRESERVATION OF NATURAL HISTORY SPECIMENS, Volume One: Invertebrates, by Reginald Wagstaffe and J. Havelock Fidler. xiii + 205 pages, 139 text figures. Philosophical Library, New York. 1955. Price $10.00.

At least a third of this volume treats methods of preserving insect specimens. Those pertaining to each major taxonomic group are taken up in phylogenetic order. An appendix gives details on apparatus, reagents, labels, storage methods, etc.

The authors are British and recommend technique commonly used, at least in the past, in their country and seldom elsewhere. This is particularly the case with their recommendations for pinned specimens. The numerous line drawings, and accompanying text, almost invariably indicate that such specimens should be glued, or pinned, belly-down on cards. Alternatives are not discussed. Such cards are supported on short English-style pins and only a brief mention is made of 'continental" length pins which are standard for the world outside of England and some of the countries of its Commonwealth. The authors erroneously state on page 150 that the longer pins are "at present exceedingly difficult to obtain."

The publishers are to be condemned, at least by entomologists, for offering this work on the American market. It is to be hoped that the high price for so small a volume will serve to discourage its use by beginners, teachers, and others who may be unprepared to discriminate between accepted and non-accepted methods of mounting insects. In defense of the authors, it might be said that their apparent intention was to instruct the British user and not to provide a universal guidebook.—E. S. Ross, *California Academy of Sciences, San Francisco.*

PLEOCOMA FROM THE HOOD RIVER VALLEY, OREGON

(Coleoptera: Scarabaeidae)

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Since reporting on some *Pleocoma* from the Hood River Valley, Oregon,[1] Paul O. Ritcher has submitted another fine series from that area which appear to be assignable to *Pleocoma minor* Linsley. These were captured four miles northwest of Dee, Hood River County, as follows:

October 19, 1954. Two males taken in flight between 6:00 and 6:30 a.m. in a drizzling rain.

October 14, 1955. Three males and five females excavated from burrows in the ground (P. O. Ritcher and F. E. Ellertson).

October 26, 1955. Eight males captured on ground or excavated from burrows (F. E. Ellertson).

October 27, 1955. Two males and two females. One male in flight during slight drizzle at 9:30 a.m., the second mating with one of the females (F. E. Ellertson).

The locality northwest of Dee is only about four miles west of the site where the major collection of *Pleocoma crinita* Linsley was made. However, the two species are quite distinct. The male of *P. minor* is wholly piceous-black, with the median punctures of the pronotum confined to the anterior half or one-third and the hairs in this depression shorter and less numerous, but tuft-like posteriorly toward middle. Also, the elytral striae are less strongly impressed and the whole insect is much less hairy. *P. minor* appears to be more closely related to *P. dubitalis* Davis, but differs in both sexes by tuft of longer hairs posteriorly in the anterior punctate depression of the pronotum. The females also have a tendency to be bicolorous with the pronotum darker.

The size range in the present sample of *P. minor* is as follows: 15♂♂, 20–23 mm. (mean 21.5 mm., with 60 per cent between 21.0 and 22.25 mm.); 7♀♀, 23–27.5 mm. (mean 25 mm.).[2] Thus, *P. minor* falls well within the size ranges of both *P. dubitalis* and *P. crinita*.

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[1] E. G. Linsley, 1956. Notes on *Pleocoma crinita* Linsley. Pan-Pacific Ent., 32:145.

[2] Measured to within 0.25 mm. accuracy from the tip of one clypeal horn to the apex of the elytron on the same side.

NOTES AND DESCRIPTIONS IN THE MEGACHILID SUBGENUS CHELOSTOMOIDES[1]

(Hymenoptera: Apoidea)

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North Carolina State College, Raleigh

Several collections of bees, mostly of the genus *Megachile*, have been submitted to the writer in recent years by a number of collectors and institutions in California, Arizona and other western states. Most of the included material has been determined and returned, but some of the data accumulated is worthy of note, and a number of apparently new species are in need of description. This paper will be limited to the western species of the subgenus *Chelostomoides* Robertson, but will include a revised key to all of the known species in the subgenus.

In so far as the habits are known, the species included in *Chelostomoides* are resin-working bees, rather than leaf-cutters in their nest building activities. The group includes some of the most highly specialized forms in the genus, and many of them are desert dwellers. Consequently, the subgenus *Chelostomoides* is well represented in the arid regions of the Southwest and in Mexico, and that area possibly is the center of origin for the group. It ranges east into the Atlantic Coast States, where the species are associated with a more mesic type of flora, and also extends south through Central America into the northern part of South America. Some of the species visit such crop plants as alfalfa, sweet clover and various other legumes, and they may have some importance as pollinators of some of these plants.

MEGACHILE (CHELOSTOMOIDES) CHILOPSIDIS Cockerell

The name originally proposed for this species, as a *Lithurgus*, was *oblongus*, not *longulus* as given in the Catalog of Hymenoptera, (Muesebeck, et al. 1951:1182). Cockerell (1900:17), described the same species as a *Megachile*, proposing the name *chilopsidis*. Later Fox (1902:137), discovering his error, assigned the species to *Megachile* and proposed *longula* to replace *oblonga* which was preoccupied in *Megachile*. Cockerell (1924:548) suggested that *chilopsidis* and *longula* could be synonymous, but apparently was not entirely convinced and continued to use both names. Finally

[1] Contribution from the Entomology Department, North Carolina Agricultural Experiment Station, Raleigh, North Carolina. Published with the approval of the Director of Research as Paper No. 625 of the Journal Series.

this writer (Mitchell 1937:408) concluded that the synonomy was correct, but through error, failed to make the change of name called for by the circumstances. All of this applied solely to the female, the male being unrecognized until recently.

A further complication now arises with respect to the identity of the male. It seems probable that the male described by Cockerell (1913:541) as *pratti* belongs with *chilopsidis*. In the Catalog (Muesebeck, et al. 1951:1183) it is associated with *discorhina* Cockerell. What the writer believes to be the true male of *discorhina* is very similar to *pratti*, and it seems likely that the two have been confused. Differences between them, however, seem to be constant, even though rather obscure without careful examination. The chief differences are as follows:

discorhina: clypeus very flat, the pubescence entirely white.

pratti: clypeus slightly convex near upper margin, with a few inconspicuous black erect hairs scattered through the generally white facial pubescence.

Neither of these males bears much resemblance to the respective females and the association has been based in large part on collection data and flower records. Recently a long series of specimens of *longula* and a shorter one of *discorhina* were received from G. D. Butler at Tucson, and while the data from these is suggestive as to the proper association of the two sexes of each, it is not conclusive. Some careful observations at the collecting sites, or of mating or nesting activities, are needed to solve the problem. It is of some importance, for if *pratti* proves to be the male of *chilopsidis*, it becomes a synonym, and *discorhina* will be the correct name for the other species.

Females of *chilopsidis* have been collected at Blythe, San Felipe Valley and Indio, California, April and June, on *Acacia greggii*, *Melilotus* and alfalfa; at Las Cruces, New Mexico, May, on *Chilopsis linearis;* and at Walton, Tucson, Yuma, Oracle, Phoenix, Papago Indian Reservation, Superior, Ray, Sabino Canyon, Apache, Buckeye, Glendale, Payson, Continental and Safford, Arizona, April–July, on *Acacia*, *Cercidium*, *Chilopsis linearis*, *Olneya tesota*, alfalfa and *Prosopis*.

Males *(pratti)* have been collected at Magnesia Canyon, California, April; and at Phoenix, Tucson, Ray, Catalina Mountains, Superior, Tasque Verde and Buckeye, Arizona, May and June, on *Cercidium*, *Acacia*, and *Prosopis juliflora*.

MEGACHILE (CHELOSTOMOIDES) DISCORHINA Cockerell

Females of *discorhina* have been collected at Cathedral City, Furnace Creek (Death Valley), Edom, Palm Springs and Indio, California, on *Larrea glutinosa, Cercidium torreyanum* and *Melilotus*: and at Oracle, Tucson, Yuma, Catalina Mountains, Ray, and at the Santa Rita Range Experiment Station, Arizona, April–June, on *Acacia, Prosopis, Cercidium* and *Larrea*. Males also were collected at Ray and at the Santa Rita Station.

MEGACHILE (CHELOSTOMOIDES) FELIPIANA Mitchell

A third female of this rarely collected species has been received from A. T. McClay at Davis, California. It bears the following data: Magnesia Canyon, Riverside County, California, July 2, 1952 (A. T. McClay). The type locality (Mitchell, 1937:405) is San Felipe Valley, San Diego County, and a second specimen was collected in the Santa Rita Mountains, Arizona (Mitchell, 1942: 118).

MEGACHILE (CHELOSTOMOIDES) ODONTOSTOMA Cockerell

(= *duplexa* Mitchell) new synonomy.

In the Revision of Megachile (Mitchell, 1937:411) it was suggested that *M. (C.) duplexa* Mitchell (1934:351) probably is the male of *odontostoma*. The collection by E. G. Linsley of *duplexa* (8♂♂) and *odontostoma* (5♀♀) together at Furnace Creek, Death Valley, April 8, 1939, on *Prosopis* would seem to indicate their common identity rather conclusively. This species has been collected also at Indio and Blythe, California, April and May, on *Prosopis* and *Melilotus*, and at Yuma, Payson, Superior, Tucson and Sycamore Canyon, Arizona, May and June, on *Acacia* and *Senecio longilobus*.

Following are additional locality and flower records for several western species of *Chelostomoides*:

M. (C.) angelarum Cockerell—Penticton, British Columbia, Aug.; Little Spokane, Washington, July; Continental Divide, New Mexico, July; Tuolumne County, Sierraville, San Jacinto Mountains, Mount Madonna, Whitney Portal, Antioch, Big Pine Creek, Mineral King, Snowline Camp (Eldorado County), Middletown, Mount St. Helena, Camino, Tiltill Valley, Calpine, Mount Diablo, Frog Creek, Quincy, Hobart Mills, Arroyo Seco, Glacier Point, St. Rosa Mountain, Keen Camp Summit, Baxter, May—Aug., and Nov. on *Lotus davidsonii, L. rigidus, L. oblongifolius, Astragalus, Cryptantha, Phacelia, Trichostema laxum, Centurea solstitialis, Lupinus, Agastache, Solidago* and *Cirsium*.

M. (C.) subexilis Cockerell—San Francisco Mountains, Catalina Mountains, Chiricahua Mountains, and Marion, Arizona, June, July, August, Octo-

ber; Logan, Utah, June; on *Salvia lemmoni, Phacelia, Vicia villosa, Lotus rigidus,* sweet pea, and red clover.

M. (C.) davidsoni Cockerell—Idyllwild, Keen Camp, Arroyo Seco, San Bernardino Mountains, California, June, on *Dicentra chrysantha* and *Pentstemon.*

M. (C.) occidentalis Fox—Loving and Las Cruces, New Mexico, May; Stockton Pass, Pinalena Mountains, Payson, Safford, Superior, Tucson, Yuma and Sedonia, Arizona, June and July; and Palm Canyon, Borego, Palm Springs, Blythe, Ripley and Piñon Flat, California, April–October, on *Lotus rigidus, Cercidium,* alfalfa, *Tamarix gallica, Nolina parryi, Chilopsis linearis,* and pepper tree. At Blythe it was found nesting in an adobe wall (Linsley).

M. (C.) lobatifrons Cockerell—Tucson and Grand Canyon, Arizona, June; and Victorville, Big Pine, Lone Pine, Blythe, Olancha, Tehachapi and Shavers Well, California, May–August, on *Cercidium* and *Prosopis pubescens.*

M. (C.) spinotulata Mitchell—Catalina Mountains, Oak Creek Canyon, and Sedonia, Arizona, May–August; Pecos, Texas, June; Stein, New Mexico, August; and Big Pine Creek, Jacumba, Camp Baldy, Big Rock Canyon, Piñon Flat, Olancha, Stone Creek, Hemet Reservoir and Herkey Creek, California, May–September, on *Eriogonum, Cryptantha, Robinia and Eriodictyon angustifolia.*

M. (C.) subspinotulata Mitchell—Catalina Mountains, Arizona, May 8, 1954 (Butler).

Megachile (Chelostomoides) texensis Mitchell, new species

Female.—*Size:* length 11 mm.; width of abdomen 3 mm.; anterior wing 7 mm. *Structure:* Length of face slightly less than distance between eyes; eyes very slightly divergent below; supraclypeal area protuberant; clypeus very short and broad, with a conical median protuberance which is about level with the supraclypeal area, apical margin broadly incurved, with a pair of strong spinelike tubercles on each side of mid line; mandibles narrow and elongate apically, with four low but quite distinct teeth, inner margin with a low subbasal tooth; first and second segments of flagellum very short, much broader than long, and the two combined only slightly exceeding the pedicel, following segments slightly longer than broad; lateral ocelli subequally distant from eyes and margin of vertex; cheeks subequal to eyes in width; metatarsi rather narrow, much shorter than tibiae, subequal in length to the following segments combined; second to fourth abdominal terga with rather deep carinate basal grooves, the sixth not appreciably grooved apically. *Sculpture:* Face and clypeus rather coarsely rugoso-punctate, the punctures becoming somewhat more distinct on vertex posteriorly and becoming finer and more distinctly separated on cheeks, but becoming crowded below; distinctly separated but irregular and rather close over the shining mesonotum and scutellum, rather close and shallow but distinctly separated on pleura above, becoming quite sparse below; rather fine, irregularly scattered and quite widely separated on abdominal terga 1–4, becoming finer and quite close on the fifth, those on the sixth obscured by dense tomentum. *Color:* Black; wings faintly infuscated, veins and stigma piceous; tegulae brownish-testaceous; flagella brownish-piceous beneath, blackish

above; mandibles black, becoming somewhat reddened apically; legs black, spurs reddish-testaceous. *Pubescence:* White in general on head, thorax and legs but with elongate erect dark hairs scattered over vertex, face, clypeus and dorsum of thorax; white and rather elongate over basal abdominal tergum, discs of the following segments with extremely short and obscure pubescence which is black on 2–5, terga 1–5 with entire white rather narrow apical fasciae, the sixth densely covered with whitish tomentum and with short erect black hairs in addition; scopa rather short, yellowish white, black on sixth sternum.

Holotype, female, SOUTHMOST, CAMERON COUNTY, TEXAS, April 13, 1950, (Beamer, Stephen, Michener and Rozens, on *Parkinsonia*.) [Univ. Calif.]

Megachile (Chelostomoides) tucsonensis Mitchell, new species

Female.—Size: length 13 mm.; breadth of abdomen 3.5 mm.; anterior wing 9 mm. *Structure:* Length of face slightly less than distance between eyes; eyes slightly divergent below; clypeus flat, about four times broader than long, apical margin with a pair of rounded and rather deep emarginations on each side of a median slight projection; mandibles narrow and elongate, dentate margin with a low and rather indefinite subapical tooth, otherwise teeth very poorly defined; basal segment of flagellum slightly longer than broad, shorter than pedicel, second slightly longer, the following segments considerably longer than broad; distance between lateral ocelli and eyes much shorter than that between ocelli and margin of vertex; cheeks subequal to eyes in width; metatarsi narrow and elongate, shorter than the respective tibiae but somewhat longer than the following segments combined; abdominal terga 2–4 with quite deep basal carinate grooves, the sixth with a subapical groove or excavation. *Sculpture:* Punctures quite coarse, deep and close over most of face and clypeus, becoming fine on vertex posteriorly and cheeks above, but very coarse, deep and close on cheeks below; coarse, deep and rather close but somewhat irregular on mesonotum and scutellum; rugoso-punctate on pleura above and anteriorly, becoming more distinct, deep and well separated posteriorly and below; close, coarse and deep on abdominal terga basally, becoming more sparse to the fourth tergum apically, those on the fifth somewhat closer, those on the sixth very fine and almost crowded. *Color:* Black; wings subhyaline, veins and stigma piceous to blackish; tegulae testaceous; antennae, mandibles and legs entirely black; spurs pale testaceous. *Pubescence:* White in general and quite short on head, thorax and legs, becoming quite dense between antennae and eyes, on pleura and propodeum, and narrowly along lateral margins of mesonotum; abdominal terga 1–4 with entire but rather narrow white apical fasciae, 2–3 white fasciate also in the basal grooves, the fifth not fasciate except at extreme sides, and the sixth with a basal transverse patch of white tomentum, pubescence of the discs very short and inconspicuous, but with evident erect blackish hairs on the fifth and sixth apically; scopa white and rather short, very short and black on the sixth sternum.

Holotype, female, TUCSON, ARIZONA, September 20, 1947 (Ross M. Ellen). [Univ. Ariz.]

Following is a revised key to the nearctic and neotropical species of *Chelostomoides*.

Females:

1. Clypeus much modified, either produced, excavated, lobed, angulate, or with deep and conspicuous apical emarginations; mandibles often slender and elongate 2

   Clypeus flattened, not much modified, at most with the apical margin denticulate, or with shallow, inconspicuous emarginations; mandibles broad apically, 4- or 5-dentate 14

2. Mandible strongly protuberant at base above 3
   Mandible not or only very slightly protuberant above 5

3. Clypeus consisting of two prominent triangular acute lobes projecting forward at right angles to the face ..... *davidsoni* Cockerell
   Clypeus with lateral rounded lobes and a more or less definite median lobe 4

4. Median clypeal lobe subequal to the lateral lobes; basal protuberance of mandible relatively small ..... *ignacensis* Mitchell
   Median clypeal lobe much broader than the lateral lobes; basal mandibular protuberance broad and inconspicuous *labiatrope* Cockerell

5. Apical dentate margin of mandible broad, nearly or quite equal to inner margin (from inner angle to base) 6
   Mandibles slender and elongate, the dentate margin very short, usually 3-dentate, sometimes with a low angle or tooth on the inner margin 7

6. Clypeus flat, the margin prominently angled at each side, and with a pair of strong submedian tubercles, forming a median and a pair of lateral deep emarginations ..... *subexilis* Cockerell
   Clypeus protuberant, or without the median emargination 7

7. Clypeal margin conspicuously bilobed, forming a pair of deep rounded emarginations ..... *occidentalis* Fox
   Clypeus protuberant, with a short but very broad, convex, pyramidal upper face and a slightly shorter shining lower face, the margin nearly straight ..... *manni* Mitchell

8. Clypeal margin with pair of rounded angles or lobes, the upper one a little [illegible] medially ..... *odontostoma* Cockerell

9. Clypeus flat, very coarsely and rather dully punctured, with a pair of rather deep emarginations on each side of a very shallow median emarginate area ..... *tucsonensis* new species
   Clypeus either subtruncate, angled or subangulate laterally, but not flattened 10

10. Median part of clypeal margin [illegible]

shining below and with a few shallow punctures above, a small protuberance on each side ..... *rugifrons* Smith

Clypeus or supraclypeal area strongly protuberant 11

11. Clypeus consisting of a narrow bowed projection just beneath antennae, the surface below oblique, broad, impunctate and polished ..... *discorhina* Cockerell

Clypeal protuberance formed otherwise 12

12. Supraclypeal area strongly protuberant, upper margin of clypeus somewhat less so, apical margin with a deep rounded median emargination ..... *felipiana* Mitchell

Clypeus more strongly protuberant, without a deep median emargination 13

13. Clypeus with an acute median protuberance, the margin broadly incurved and with a pair of small submedian tubercles ..... *texensis* new species

Clypeus medially and supraclypeal area strongly and evenly elevated, lateral portions of clypeus depressed below this level and with a lower polished and imputate face at right angles to elevated area ..... *chilopsidis* Cockerell

14. Clypeal margin entire, neither denticulate nor emarginate 15

Clypeal margin either denticulate or slightly emarginate 16

15. Clypeal margin straight from side to side, (nearctic) ..... *georgica* Cresson

Clypeal margin broadly triangular, having an obscure median angle (neotropical) ..... *peruviana* Smith

16. Mandible distinctly 5-dentate; sixth tergum with a deep subapical groove ..... *spinotulata* Mitchell

Mandible 4-dentate; or indistinctly 5-dentate, but without a groove near apex of sixth tergum 17

17. Clypeal margin with at least a slight median denticle 18

Clypeal margin lacking a median denticle, but with a distinct median emargination 22

18. Abdominal terga 4–6 covered with dense fulvous tomentum; clypeus with a narrow median raised line (neotropical) ..... *otomita* Cresson

At least the fourth tergum lacking dense tomentum other than the apical fascia; clypeus without a median raised line 19

19. Clypeal margin with five nearly equal and evenly spaced denticles, mandible distinctly 4-dentate, sixth abdominal tergum with dense white tomentum obscuring the surface (neotropical) ..... *haematoxylonae* Mitchell

Clypeal margin not as above 20

20. Clypeus with numerous erect and rather long black hairs interspersed among the shorter subappressed white hairs; mandible obscurely 5-dentate (neotropical) ..... *abacula* Cresson

Pubescence of clypeus entirely white 21

21. Clypeal margin with a shallow and narrow median emargination, this with a small median denticle; fifth abdominal tergum white fasciate apically ..... *exilis* Cresson

Clypeal margin with a shallow but very broad median emargination, in the center of which is a strong tubercle; fifth tergum not fasciate ..... *subspinotulata* Mitchell

22. Fifth abdominal tergum white fasciate apically; western ..... *angelarum* Cockerell

Fifth tergum not fasciate; eastern 23

23. Pubescence of sixth abdominal tergum entirely pale; wings only lightly infuscated ..... *campanulae campanulae* Robertson

Sixth tergum with short erect black hairs in addition to the whitish tomentum; wings quite deeply infuscated ..... *campanulae wilmingtoni* Mitchell

Males

1. Mandible without an inferior tooth or projection 2

Mandible with a distinct basal or submedian tooth or protuberance beneath 10

2. Carina of sixth tergum narrow and protuberant, the apex emarginate ..... *lobatifrons* Cockerell

Carina of sixth tergum either bidentate or very low and with but a slight median emargination 3

3. Clypeal margin tuberculate or denticulate 4

Clypeal margin entire medially 6

4. Clypeus with conspicuous erect black hairs interspersed in the generally white and dense pubescence; abdominal terga 4–5 covered with dense fulvous tomentum (neotropical) ..... *abacula* Cresson

Clypeus with but very few and inconspicuous black hairs or none; abdominal terga 4–5 not densely tomentose 5

5. Clypeal margin with a single robust median tubercle (neotropical) ..... *peruviana* Smith

Clypeal margin with a pair of rather robust tubercles and between them a relatively slight median denticle ..... *manni* Mitchell

6. Carina of sixth tergum conspicuously bidentate 7

Carina of sixth tergum very low and inconspicuous, with at most a barely evident emargination 8

7. Clypeus quite flat, even above, and with entirely white pubescence ..... *discorhina* Cockerell

Clypeus somewhat convex above, and with a few inconspicuous black hairs scattered among the generally white hairs ..... *chilopsidis* Cockerell

8. Punctures of vertex very coarse, much more so than those of mesonotum; lateral ocelli nearer to eyes than to margin of vertex

.....*rugifrons* Smith
Punctures of vertex about equal to those of mesonotum: lateral ocelli subequally distant from eyes and margin of vertex..... 9

9. Clypeal margin with quite deep lateral emarginations, the median area straight but the center somewhat impressed: segment 2 of flagellum about four times the length of segment 1, and equal to the following segments.....*browni* Mitchell
Clypeal margin with low subequal median and lateral emarginations; segment 2 of flagellum shorter than 3, and about three times the length of segment 1.....*odontostoma* Cockerell

10. Front tarsi concolorous with their tibiae and femora, only slightly dilated and lower surface little if any excavated..... 11
Front tarsi modified, more or less widely dilated and flattened, contrasting with their tibiae in color, and often deeply excavated beneath 15

11. Discs of abdominal terga 4–5 well covered with short erect black pubescence, but this not hiding the surface.....*angelarum* Cockerell
Pubescence of terga 4–5 entirely pale..... 12

12. Fourth abdominal tergum rather sparsely punctate, interspaces considerably exceeding diameter of punctures (neotropical) .....*cartagenensis* Mitchell
Fourth tergum more closely punctate, interspaces not exceeding diameter of punctures..... 13

13. Front coxae with very short but relatively distinct spines; punctures of vertex and mesonotum about equal .....*subexilis* Cockerell
Front coxal spines reduced to dentiform tubercles; punctures of vertex somewhat coarser than those of mesonotum..... 14

14. Wings lightly infuscated; punctures of vertex only slightly more coarse than those of mesonotum.....*campanulae campanulae* Robertson
Wings more deeply infuscated; punctures of vertex much more coarse than those of mesonotum.....*campanulae wilmingtoni* Mitchell

15. Front metatarsi rather widely dilated and flattened, but not at all excavated beneath 16
Front metatarsi more or less deeply excavated beneath..... 18

16. Apical segment of front tarsus much longer than the metatarsus (ratio of 3:2).....*davidsoni* Cockerell
Apical segment of front tarsus no more than equal in length to the metatarsus 17

17. Apical segment of front tarsus about equal in length to the metatarsus .....*occidentalis* Fox
Apical segment of front tarsus about half the length of the metatarsus .....*georgica* Cresson

18. Front coxal spines well developed..... 19
Coxal spines reduced to obscure dentiform tubercles..... 20

19. Front coxal spines long and slender, discs of abdominal terga 1–6 not tomentose..... *spinotulata* Mitchell
Front coxal spines short, acute, subtriangular; abdominal terga 1–6 entirely covered with fulvous tomentum (neotropical)....*otomita* Cresson

20. Third segment of front tarsus narrower than the second segment, and becoming still narrower apically.....*exilis exilis* Cresson
Third segment of front tarsus about as broad as the second segment, truncate apically.....*exilis parexilis* Mitchell

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Book Review

THE BEETLES OF THE PACIFIC NORTHWEST. PART I: INTRODUCTION AND ADEPHAGA. By Melville H. Hatch. University of Washington Publications in Biology, Vol. 16, pp. 1–340. Paperbound, offset. Published December 20, 1953. Price $5.00, from the Univ. Wash. Press, Seattle 5.

"If only this had been available when I was a beginner!", is the reaction of most West Coast coleopterists to Dr. Hatch's first volume. The series is equally welcome now, and will be an invaluable source and stimulus for those just broaching our hobby.

This is a work[1] on the beetle fauna of British Columbia, Washington, Idaho, and Oregon: it is a text for identifying to species, and in many

[1] Volume II has been completed and will appear soon.

instances even to aberrations. Ten new species are described in the keys and associated footnotes: one new name is proposed.

The long-time value of a comprehensive regional work on beetles is shown by Blatchley's 'Coleoptera of Indiana," still in demand though published in 1910. There is every reason to expect an equal life for Hatch's series; yet he has set himself the more difficult task, for collecting in the area covered has been hardly more than a sampling of favored spots, or of tracts near centers of population. For that very reason, by attracting new students, by making identifications possible for amateurs and persons far from libraries or reference collections, the volumes should advance our knowledge rapidly. This will result in papers which will add to both the interest and value of our West Coast entomological journals.

The book[2] has a general introduction, with historical data and acknowledgments; a section on the external structure of beetles (text figs. 1 and 2, of antennal types); notes on techniques; a discussion of geographical factors in the region covered, with a valuable annotated list of introduced species; and short sections on ecological relationships and economic importance. The taxonomic treatment begins on page 33 with a key to the suborders of Coleoptera. The families included in this volume are Cupedidae, Carabidae, Haliplidae, Amphizoidae, Dytiscidae, Gyrinidae, and Rhysodidae, in that sequence. There is an 11-page bibliography, separate indexes to generic and specific names, and a valuable set of 38 plates amongst which the figures drawn by Daniel Bonnell are outstanding.

The use of abbreviations makes it imperative for the casual reader to refer to the explanations on page 1. For instance "Wn." or "Or." in the distributional records for a species indicate that it occurs both to the east and to the west of the Cascade mountains in Washington or Oregon. But for British Columbia, "B.C." refers to an occurrence in two or more quarters, two of which are diagonally opposite; while in Idaho, "Id." refers to an occurrence in northern Idaho and either southwest or southeast Idaho, or both. An outline map of the area covered, with the above divisions shown, would have been a clarifying addition.

One thing the user of any regional work must keep in mind: peculiar results come from running a specimen through the identification tables, when it is in fact a new record for the area, and not included in them. There is a strong argument for the use of phylogenetic-type keys in such a work, for there is likely to be at least one higher category which includes the new find, and identification may be continued from there in other works.

In trying out the keys, it was the reviewer's good fortune to have many specimens, including both terrestrial and aquatic species, which had been identified by Hatch. To see where the beginner trying to name his beetles might have difficulty, each example was started at the opening couplet of the key to suborders (p. 33), and traced through to its specific identification. The following notes are a result. Another result is an abiding dislike

[2] Though the cover shows only "Volume 16, pp. 1-340", a collation gives viii+ 340 pp., pages i, vi, viii, and 256 being blank, while p. ii is the frontispiece, an un-numbered plate. There is a tipped-in errata slip on p. vii; pp. 258-331 constitute pls. I-XXXVII and their explanations.

of the mechanics of the form of key used in this book. Surely one in which the opposing choices in each division are kept together as couplets, with bracketed numbers to allow backtracking, is easier and quicker to work. Some of the differential characters used in the keys to genera have proved troublesome, but may not worry beginners, especially if they make full use of the plates. Many a generic segregate has a recognizable habitus, and students will probably go straight to the keys to species.

Page 9.—After returning from a summer spent in collecting, chiefly about Gray's Harbor, Wash., Coos Bay, Ore., and Siskiyou, Calif., Dr. E. C. Van Dyke joined the Department of Entomology at Berkeley as an Assistant in Entomology. This was in 1913, not 1915. The W. J. Chamberlin collection of Buprestidae was purchased by Van Dyke, who donated it to the California Academy of Sciences in 1945.

Page 10.—Judging by the data in Essig's 'History of Entomology," L. E. Ricksecker should be included in the list of Pacific Northwest collectors. Mr. Gentner's initials are L. G.

Page 33.—Beginners are likely to have trouble with the first two rubrics of the key to the suborders of Coleoptera, unless they study Pl. I, fig. 3 carefully. More illustrations of parts referred to in the keys, and not so many of whole insects, would help users of the book.

Page 34.—Page numbers after family and other terminating names in the keys, throughout the book, would save the reader much time.

Page 35.—Under "2" in the key to subfamilies, the statement ". . . clypeus produced laterally over the bases of the antennae" surely ought to be ". . . beyond the bases of the antennae."

Under "3," for prosternum and meosternum read mesosternum and metasternum; refer the reader to Pl. I, fig. 3.

Page 36, *et seq.*—The inclusion of synonymies is a valuable feature, not only to acquaint one with the literature, but as a reminder that our series should always be viewed with suspicion, for synonyms sometimes prove to represent valid zoological entities. Subgeneric names, as used in the keys and text, are equally valuable memoranda.

Page 43.—Under "6'," the statement ". . . labrum entire" is hardly a true description of the anteriorly emarginate labrum of a species such as *Carabus taedatus* Fabricius.

Pages 45 and 46.—In rubrics 2 and 2' the decision between "Male protarsi broadly dilated . . ." and "Male protarsi narrowly dilated . . ." rivals Hobson's choice. Perhaps the tarsi could be compared with some other structural feature as a standard.

Page 54.—The Saamich district (midpage) should be Saanich.

The fossil species *Calosoma (Callitropa) fernquisti* Cockerell from Miocene beds near Spokane is mentioned; it is to be hoped that all other fossil species of beetles from the Pacific Northwest will be listed.

Page 70.—Under "2," there should be a warning that some Agonini have what appears to be a puncture in the mandibular scrobe, though it is not setiferous; in fact it may be more obvious than is the actual setiferous puncture in, say, *Nomius pygmaeus* Dejean.

Page 72. Under *Patroboidea rufa* Van Dyke, the reference should be

to Pl. IV, fig. 4, not 3; figures 3 and 4 have been transposed on the plate.

Page 74. The figure reference for *Vomia pygmaea* should be Pl. IV, fig. 3; see preceding comment.

Page 105. In the key to genera (Ptero-tichini), for "Labial palp with last segment bi-setose . . ." and "Labial palp with last segment pluri-setose . . .", read ". . . next to last segment . . ."

Page 190. All British Columbia examples of *Haliplus longulus* LeConte seen by the reviewer (including those det. by J. B. Wallis, and by the reviewer prior to 1951) have proved upon dissection to be other species.

Page 193. Add 1944 to the reference following *Haliplus wallisi* Hatch.

Page 197. *Bidessus ornatellus* Fall is sexually dimorphic as to the margined clypeus, so only males will key correctly here.

Page 198. The subgenus *Clypeodyta*, as defined here, is sensu Hatch, not Régimbart.

Pages 200 and 201. The varietal name *lineola* should be *lineellus*.

Page 203. The subgenus *Hetero-ternus* Zimmermann as here conceived is not a natural unit: the median backward angulation of the conjoined hind coxal processes of, say *Hydroporus superioris* J. Balfour-Browne and *planiusculus* Fall, are only superficially alike. The species *planiusculus*, *mulkini* Hatch, *vilis* LeConte, and *pacificus* Fall are, however, members of a monophyletic group in which the aedeagus of the male is apically bifid.

Page 214. *H. (O.) rainieri* Hatch and *productotruncatus* Hatch (see rubric 107) are readily distinguished by characters of the male genitalia, hence likely to be valid species rather than forms of a polytypic species.

Page 215. — COLYMBETINAE. (Last word on page) should be COLYMBETINI.

Page 230. The generic name "*Pseudoxcutopterus* Balf." given here is a *lapsus memoriae* for *Neoxcutopterus* J. Balfour-Brown (1943, Proc. Royal Ent. Soc. London, (B) 12 (11–12):172). Presumably *Pseudoxcutopterus* is an erroneous subsequent spelling, with no separate standing in nomenclature.

Page 231. In 1954 the generic name *Rantus* Dejean, 1833, was officially emended to *Rhantus*, in Opinion 289 of the International Commission on Zoological Nomenclature.

Page 235. The author of the generic names *Hydaticus* and *Acilius* is Leach, not Leech.

Page 238. The species name *oolibuckii* Kirby should be *ooligbukii*: it is mis-spelled *ooligbuckii* in the 1948 Balfour-Browne reference, and also in his earlier paper (1947, Ann. Mag. Nat. Hist., (XI) 13 (103):452–453).

Page 239. The reference to Criddle, 1929 (under *Dineutus* and *Gyrinus*, bottom half of page) should be credited to W. J. Brown, in Criddle's "The entomological record, 1928. Notice of capture."

Pages 245 and 255. Okanogan should be Okanagan (the first spelling is correct in the State of Washington, but not in British Columbia.)

Page 246. In line 6, Mount Chem should be Mount Cheam.

Page 249. Harvey's initials are R. V. The reference "4:2" at the end of the citation to his 1906 paper seems to be an error, as there are no Coleoptera listed on that page.

The Hatch paper cited as 1928 was actually published on January 9, 1929.

Page 253. The paper cited as "Prov. Mus. 1898." without author, should be credited to John Fannin; the Coleoptera are on pp. 71–75.

To ensure that beginners of the next few years will know of revisionary papers which change the names of genera and species treated in this series, it is hoped that there will be a summary statement in each succeeding volume, applying to the one or more before. Or perhaps a continuation of Hatch's own most useful indices[3], or supplements to that by Edwards[4] can be produced.

In conclusion, it matters not that we individually disagree with some of Dr. Hatch's taxonomic findings, for the broad implications of a series of volumes on the Coleoptera of the Pacific Northwest far transcends this. All workers, including those of us who merely sit and criticise, must be forever indebted to Melville Hatch, the man who has "done something about it!"—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*

[3] Hatch, M. H. 1927. A systematic index to the keys for the determination of the Nearctic Coleoptera. Jour. New York Ent. Soc., 35(3):279-306. Supplements in 1929 (*loc. cit.* 37 [2]: 135-143), and 1931 (49 [1]:21-42).

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JAMES EDWARD COTTLE (1861-1953)
(See Leach, 1956, Pan-Pacific Entomologist, 32:19-21)

OBSERVATIONS ON THE NESTING HABITS OF EUCERCERIS FLAVOCINCTA CRESSON

(Hymenoptera: Sphecidae)

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During July, 1954 a nesting site of *Eucerceris flavocincta* Cresson was discovered near Independence Lake, Sierra County, California, at an elevation of 6,950 feet. The find was interesting because of the extensive nature of the site and the unusual character of the wasp prey. The only previously published records of the nesting habits of the genus *Eucerceris* were those of Scullen (1939), and Linsley and MacSwain (1954). Scullen, working in northwestern Oregon, gave observations on two small nesting sites of *E. flavocincta* containing several dozen burrows in open rocky ground, the prey being adult broad-nosed weevils, *Dyslobus lecontei* Casey. In addition Scullen mentioned unpublished records of *Dyslobus segnis* LeConte used by *E. flavocincta* in Oregon, and *Ophyrastes sulcirostris* (Say) (given as *Ophyeaster subcerosteis*) used by *E. superba* Cresson in North Dakota. Linsley and MacSwain published observations on six females of another species, *E. ruficeps* Scullen, made at Antioch, California in the fall of 1952. In this instance the prey was a mixture of two weevils, *Dysticheus rotundicollis* Van Dyke and *Sitona californicus* Fahrens.

The site at Independence Lake existed along a series of bare silt and gravel hills forming the berm of a ditch about 150 yards in length, excavated about 12 years previously. Each hill was about 10 feet high and 20 feet in diameter, The surface layer of 3 to 8 inches was mostly clay, and beneath this was gravel and sand. Thousands of open burrows were in evidence, all of which appeared to be those of *E. flavocincta*. It is interesting to note, however, that in the case of *E. ruficeps*, Linsley and MacSwain found that abandoned burrows of Halictine bees were utilized. No females of *E. flavocincta* were observed at the Independence Lake site engaged in digging operations and speculation could be made that the wasps may have appropriated burrows of another species. However, no proof of this was evident at the time, and many of the burrows on excavation were found to be no longer in use.

During the afternoon of July 17, hundreds of wasps were observed flying to the area, and two or three were seen coming in for landings continuously. Fewer were seen on July 20 which

was windy. Each of the incoming wasps carried an adult weevil clasped to its venter. The weevils examined were all of an undescribed genus near *Dyslobus* according to P. C. Ting who had collected a short series of the beetles from vegetation in the Webber Lake drainage basin nearby.

Excavation showed that most of the tunnels were about five inches long, entering the ground at right angles with an orifice of about five-sixteenths inch diameter, proceeding for about one and one-half inches, then angling into the hill and widening into a main chamber with a diameter of five-eights inch. Up to four cells were observed associated with each main tunnel, three to five inches below the surface. Each cell was oval, seven-eighths inch long, three-eighths inch wide and contained six to nine weevils (usually eight) when fully provisioned. Various stages in the life history of the wasp from egg to pupa were observed. One cell was found with a whitish oval egg, 3 mm. long and 1 mm. thick, attached to the venter of one of the weevils. In cells of another burrow, one contained a half grown larva, two contained pupae and a fourth had an empty pupal case. Several larvae were observed, each feeding through the anterior abdominal opening of a dismembered weevil. By the time of pupation, all the weevils consisted of empty separated shells. The wasp pupae observed were found in the debris of the cell without a silken cocoon and were five-eighths inch in length.

In several instances the tunnels, which were left open at all times were being inspected by large deep-blue chrysidids, although no parasitized cells were observed. Specimens of the wasp were subsequently identified as *Hedychrum nigropilosum* (?) Mocsary by K. V. Krombein.

It is an interesting commentary on collecting methods that without special effort, more than 50 specimens of the little known host beetle were taken from a small proportion of the incoming female wasps, and from the provisioned cells.

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NOTES ON PLEOCOMA CRINITA LINSLEY

(Coleoptera: Scarabaeidae)

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Through the kindness of Paul O. Ritcher the opportunity has been presented for studying a fine series of *Pleocoma crinita* Linsley from the Hood River Valley region of Oregon and a small series from a nearby area in Washington. This species was previously known from two male specimens from Glenwood, Klickitat County, Washington. This material exhibits considerable local variation and suggests that quantitative differences may exist between certain local populations. Some of the variations among males are as follows:

Odell, Hood River County, Oregon. One hundred and five males, collected in flight or excavated from the ground between October 12, 1953 and December 31, 1953, by P. O. Ritcher, Vernon Olney and D. McKeown. These range in length[1] from 20.25 mm. to 24.0 mm. with 80 per cent of the individuals falling between 21 mm. and 23 mm. In coloration they vary from almost uniformly castaneous or reddish-brown (two specimens) to almost wholly piceous (three specimens). The majority, however, are distinctly bicolored with the elytra subpiceous to piceous (65 specimens) or more or less reddish-brown (16 specimens). The transition, however, is gradual and the separation arbitrary. The characteristic dense longitudinal band of erect pronotal hairs is present in all. In most individuals the long pubescence elsewhere on the pronotum is aparse but in 10 per cent it is relatively dense.

Mozier, Wasco County, Oregon. Two males, January 29, 1931, collected by W. W. Lawrence. These are 22.5 mm. and 23.5 mm. in length, respectively. Both are uniformly reddish-brown. Both have the longitudinal band of erect pronotal hairs but it is somewhat reduced. The remainder of the pronotum is glabrous.

Oak Grove, Hood River County, Oregon. Ten males, excavated from the ground between December 2, 1953 and December 30, 1953. In length these range from 20.25 mm. to 23.25 mm. with a mean of 22.5 mm. In coloration this small series varies from unicolorous reddish-brown to bicolorous with piceous elytra but does not exhibit the extremes evident in the long series from Odell.

[1] Measured to within 0.25 mm. accuracy from the tip of one clypeal horn to the apex of the elytron on the same side. J. W. MacSwain kindly assisted with the measurements.

The most obvious feature of these individuals is the greater average hirsuteness of the body which is particularly evident on the pronotum.

Husum, one mile north, Klickitat County, Washington. Seven males, collected on October 14, 1954 and November 9, 1954, by F. Ellertson. In length these range from 19.5 to 22.5 mm. with a mean of 20.7 mm. Thus the average size of the individuals in this small sample is considerably less than in those from other localities and may reflect the fact that, unlike the others, they were collected from a non-irrigated orchard (Ritcher, *in litt.*). In coloration they range from almost uniformly castaneous (2) to distinctly bicolored with the elytra subpiceous (2) to piceous (3).

Pleocoma minor Linsley, is known only from two males from Hood River, Hood River County, Oregon (holotype in the California Academy of Sciences Collection, paratype in A. T. MacClay collection). It occurs in the same general region as *P. crinita*, but judging from these specimens it is smaller (19.5 mm.) in average size, duller, uniformly brownish-black, and the median line of dense pronotal punctures is limited to the anterior one-third, as are the erect hairs which are short rather than long.

The female of *Pleocoma crinita* differs from all others known to me in that, as in the male, the median line of dense prothoracic punctures extends for the length of the pronotum and this line and the scutellum are clothed with long hairs. A series of 76 females from Odell, Oregon, taken with the males referred to above, vary in length from 20.75 mm. to 30.25 mm., with 88 per cent in the 23–28 mm. range. Seven females from the Oak Grove locality vary from 24.5 mm. to 28 mm., two from Husum are each 20.25 mm., and one from Pine Grove, Hood River County, Oregon is 22.5 mm. A second female from this last locality is 28.5 mm. in length and differs from all of the others in that the longitudinal band of dense pronotal punctures is ill-defined and evident mainly in the mid-discal region. However, this limited impression is clothed with erect hairs and the specimen may possibly represent *P. dubitalis* Davis or *P. minor* Linsley.